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ABSTRACT

Prepared by two Unesco consultants following a one-month visit requested by the People's Republic of China, this report presents observations and advice for the development of the Institute of Scientific and Technical Information of China (ISTIC). The objectives of the mission were to advise on the functional structure of the institute; advise on the selection of equipment and other materials for the new building of the Institute; provide estimates of manpower, equipment, and financial resources required; draw up a plan for the development of information services; advise on technical and financial details of the institute; and to be available for future consultation on any other technical problems. Little documentation was available to the consultants, thus the report relies primarily on verbal data, mostly via translation. The report includes recommendations to ISTIC, background information on existing facilities, ISTIC's planning for computer applications, computer and software options for bibliographic information services, an architectural brief for the ISTIC building, and building problems and proposals. Appendices provide a list of participants and the findings of a similar trip to Japan along with its 21 references. This paper includes 18 references and a 13-item bibliography of documents produced by ISTIC. (RAA)

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PEOPLE'S REPUBLIC OF CHINA

# DEVELOPMENT OF THE INSTITUTE OF SCIENTIFIC AND TECHNICAL INFORMATION OF CHINA (ISTIC)

by Michael Brawne
Stephan Schwarz

Report prepared for the Government of the People's Republic of China by the United Nations Educational, Scientific and Cultural Organization (Unesco)

U N E S C O

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PREFACE

The present report was prepared in the framework of a one-month consultant mission (9 July - 8 August 1980) organized at the request of the Government of China to advise on the development of the Institute of Scientific and Technical Information of China.[x)] During the mission two consultants were respectively charged by Unesco to

a. advise on the establishment of the functional units of the Institute of Scientific and Technical Information of China which will be responsible for functions of the Institute including acquisition of domestic and foreign scientific and technical information and literature as well as video tapes and information-bearing tapes; provision of users with reading, audiovisual and reprographic services; abstracting and indexing services; the building up of a data bank and eventual establishment of a national information network for China; analysis and consolidation activities; publication of journals; translation; organization of national and international exhibitions, meetings and conferences;

b. assist in the selection of equipment and other materials for the new building of the Institute;

c. provide estimates of the manpower, equipment and financial resources necessary for the installation of the functional units of the Institute;

d. draw up a plan for the development of the information services of the Institute, in consultation with the local authorities.

and to:

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x) Throughout this report the Pin Yin form of transliteration, which is the official version approved by the People's Republic of China, is used. This occasionally leads to such well known names to non-Chinese as Peking taking on the more unfamiliar form of Beijing.

e. advise the national architects on matters regarding materials, design and construction, if requested, on the construction of the new building;

f. advise on a rational layout to improve efficiency through proper organization of the flow of materials and personnel;

g. advise on flexibility in the layout of the building, including the heating, ventilation and electrical appliances, so as to allow for future change;

h. advise on possible economies of investment and energy and on the maximum use of natural ventilation and natural light;

i. be available for consultation on any other technical problems.

This report has been written jointly by the two consultants appointed by Unesco in order to avoid duplication and to reflect an integrated view of the mission. Inevitably that part dealing with information services and library organization was largely the responsibility of the consultant of information services, Stephan Schwarz, and that dealing with the building, mainly the work of the architect member of the mission, Michael Brawne.

The consultants were enormously helped in their mission in Beijing by the work prepared in advance by the Institute of Scientific and Technical Information of China (ISTIC). This work had involved the production of a large amount of statistical information, papers describing the organization of the Institute as well as a detailed schedule of areas for the proposed building. In addition to this, the Beijing Institute of Architectural Design, which is responsible for the design of the new building, had already prepared four different architectural schemes. The latest of these formed a most valuable starting point for the design which was evolved with all concerned during the mission.

The consultants are also most grateful to Mr. Lin Zixin, Director of ISTIC, and members of his staff for the very many courtesies which were extended and which made the visit to Beijing so enjoyable and instructive. Special

appreciation is due to those two groups in the Institute with which the consultants were most closely concerned: one group headed by Mr. Zhang Fenglou, Deputy Director of Computer Services and the other by Mr. Lan Baili, Deputy Director of the Office of Building Projects. Mr. Liu Zhaodong, Deputy Director of the Division for International Relations and Co-operation, who was responsible for the organization of the visit, provided consistently valuable support.

The consultants also visited a number of other related institutions in Beijing which are listed in Appendix 1 and which provided valuable assistance and much helpful additional information. In addition the consultants were asked to undertake a number of other engagements. Both lectured to professional audiences in an all-day programme arranged by ISTIC; Stephan Schwarz lecturing on "The introduction of computerized documentation and information: principles and experiences" and Michael Brawne giving an illustrated lecture on "Principles guiding the design of a library building in Beijing". Michael Brawne also lectured at the Technical Information Institute of the Academy for Building Construction on "Current Architectural thinking in England". The consultants also spent a day and a half at the Beijing Library where they were asked to make comments on the organization of the new building and on the provision of computerized services.

It should be added that, due to the rapid developments in this field in China during the last few years, relatively little documentation was available to support all the evidence we gathered during our visit. Apart from documents provided by ISTIC, most of the information was given verbally. It was not always easy, sometimes due to translation problems, to establish a fully consistent picture from all the details presented. It is felt, however, that the picture formed is sufficiently valid to justify the proposals outlined in this report.

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# I. RECOMMENDATIONS ON THE DEVELOPMENT OF THE INSTITUTE OF SCIENTIFIC AND TECHNICAL INFORMATION OF CHINA (ISTIC)

As a result of the points raised in this report the following recommendations are made:

Recommendation 1

A strategy for ISTIC efforts in Chinese character processing (the key problem in the implementation of any ISTIC computerization scheme involving information input from ISTIC itself) should be clearly formulated before a coherent analysis of computer needs can be made. To this end ISTIC should, in contact with major centres of excellence in the field, make a major effort to critically review the state of the art in Chinese character processing (and in Chinese-English machine translation if this is regarded as a major priority), and to plan the development of an ISTIC Chinese character processing system.

Once a strategy has been adopted and the appropriate equipment obtained, pilot work can be started immediately, although an operational system will only be established after several years of development with active involvement of ISTIC (see paragraphs 64-66 of this report).

Recommendation 2

The hardware and software requirements for those ISTIC programmes to be implemented using Roman alphabet processing should be specified by investigation of:

a. User needs for information and documentation services and ISTIC policy for service development up to 1990 (the approximate lifetime of a new computer system);

b. Available software for selective dissemination of information (SDI) and for on-line (retrospective) searches, and its implications for the selection of computer hardware (see paragraphs 67-72);

c. The feasibility of using available facilities at the Information Processing and Training Centre for International Economic Cooperation (in particular the Burroughs B6810 and HP 3000), as a less costly alternative in the short or medium terms for developing SDI services and certain pilot programmes of ISTIC. Compatibility of this equipment with available file management, on-line retrieval, and off-line retrieval software, as well as demands on computer resources and cost factors, should be considered.

Recommendation 3

A policy decision on the specifications and installation schedule for the computer configuration for ISTIC's information and documentation services in science and technology should be made as soon as possible. For this purpose the future ISTIC programmes for computerized information services should be considered as two separate lines of action: one line (Recommendation 1 above) dealing with development of Chinese character processing and its applications, the other (Recommendation 2 above) concerned with using established techniques to provide computerized information and documentation services based on available foreign and international bibliographic files and to develop library management routines based on standard alphanumeric processing. Serious consideration should also be given to pursuing some of the urgent projects, e.g. the Research and Development (R&D) Project file and the Chinese Science and Technology Literature file, in English translation (or Pin Yin) during this initial stage (see paragraphs 88-89).

In spite of this separation, it should be possible to select a computer configuration which can be used for both lines of action with a view to subsequent integration of operations.

Recommendation 4

When the need and specifications for an ISTIC computer have been established, funds should be sought from sources of support such as the United Nations Development Programme (UNDP) or the United Nations Interim Fund for Science and Technology for Development. This application should foresee:

a. A computer with peripheral equipment and appropriate spare parts;

b. Training programmes for hardware, systems and software engineers;

c. Specifications for any studies or technical development projects to be carried out in cooperation with the computer manufacturer(s);

d. Maintenance costs (about 5% of the purchase cost per year during the expected use of the system, e.g. 1982-1990) to cover supply of spare parts and system update expenses;

e. Development and implantation of adequate software packages (or transfer and implantation of existing packages) for selective dissemination of information (SDI) services, for SDI profile handling, for bibliographic data file and library management, and possibly also for on-line retrospective search services.

If the use of an existing external computer is envisaged in the short or medium term, assistance could be sought to cover the aspects of the above components which are relevant to such a phase.

Recommendation 5

As soon as a decision has been made on the computer to be used (and financing seems possible), ISTIC should act to prepare for and implement SDI services based on a broad selection of external data bases (on a national scale and at a level of use judged to be adequate) along with associated training and promotion programmes and a network for back-up services to provide full text of retrieved documents (see paragraphs 79-85).

Recommendation 6

Detailed study should be undertaken on the technical, administrative and economic aspects of ultimately introducing a comprehensive on-line information retrieval service in China (see paragraphs 86-87). At the same time a

number of special (preferably on-line) applications (e.g. a file of R&D Projects in progress in China, a file of Chinese Science and Technology Literature, and a number of information management applications) should be initiated as soon as possible (see paragraphs 88-93).

Recommendation 7

ISTIC should consider a change in acquisition policies, allowing an increase in the stock of monographs in the ISTIC collection (see paragraphs 94-95).

Recommendation 8

ISTIC should give priority to increasing its capacity to reproduce a large number of documents, in view of an expected increase in demand as information services are extended (see paragraphs 96-97).

Recommendation 9

A programme for a national and regional training centre for information professionals (e.g. documentalists) at ISTIC should be worked out, with reliance on external training as appropriate and with emphasis on human resources for the information services and systems to be developed by ISTIC. Support for implementation of regional training activities should be sought within the developing Regional Network for Scientific and Technological Information in East and South-East Asia, in which ISTIC should be given responsibility as a national node, in view of its coordinating role in the field of scientific information in China (see paragraphs 98-100).

Recommendation 10

The planning of the ISTIC building should be carried out on the basis of the plans shown in this report with such modifications as are necessary when full constructional drawings are prepared (see paragraphs 115-138).

Recommendation 11

In view of the particular importance of furniture in the use of an information centre, a study of appropriate library furniture should be undertaken at an early stage and certainly before the constructional drawings are finalised. Unesco is prepared to offer further advice on this selection, if requested, at the appropriate time.

## II. BACKGROUND

1. In 1977 the Government of the People's Republic of China introduced the concept of the Four Modernizations, namely in Agriculture, Industry, Defence, and Science and Technology. Within the last category, considerable emphasis is being placed on the need for the dissemination of information and the provision of an adequate and effective information network. The Institute of Scientific and Technical Information of China (ISTIC) established directly under the State Scientific and Technological Commission, is seen as the national centre of such a network.

2. The great emphasis which is currently being given to information services can perhaps be gauged by the fact that in addition to the planning of a major new building for ISTIC, plans are also far advanced for the construction of a new building for the Beijing Library (the National Library of China) and for the Library of the Chinese Academy of Sciences. The new Beijing Library, for instance, is to be an extensive complex of 140,000 $m^2$ housing 20 million books and catering for 3,000 readers.

3. All the research library institutions are keenly interested in the use of computers for library management and information services. The use of computers is likely to be particularly important since the new science and technology policy involves an enormous increase in the number of scientists in the country (see paragraphs 7-8). Clearly, within the near future there will be a very great increase in the demand for scientific and technical information; ISTIC's role in this provision is certain to be crucial.

The Research & Development (R&D) System in China

4. The Chinese R&D system and its system for higher education have largely been built up in the period after 1949. The decade 1966-76 clearly brought about a serious cutback in its development. The present policies, however, emphasize science and technology as a fundamental asset in the realization of the "four modernizations" for the economic and social transformation of the country. Any project for provision of information and documentation services to the R&D system in China must take its powerful growth into account, which probably has no parallel in the world today.

5. R&D statistics are notoriously difficult - there are always problems of defining adequate quantitative indicators and there are also associated conceptual problems; problems of delimitation, difficulties of coverage and of compatibility in the reported data. In the extremely dynamic Chinese system of today these problems become still more acute. Yet, some official figures give a good enough picture with respect to the planning of a system of information support for research and development.

6. The concept of "science and technology" is understood in China more or less in the same way as in the English-speaking tradition. It should, however, be noted that the activity of "research" is seen in a systemic way as including all components on all levels related to scientific and technical development and its immediate applications (reference 6). The Chinese concept of science and technology thus emphasizes physical sciences and their applications and tends to exclude social sciences, humanities and a large part of the life sciences. Exceptions in the last case are obviously technology-related aspects of, for example, pharmacology, environmental protection and agricultural production.

7. According to official sources, the total R&D budget for 1979 is at 6 billion (thousand million) Yuan or about US$ 4 billion. About six million people are employed in the R&D-related sector including innovative industry. According to information given by the State Scientific and Technological Commission (Oct 29, 1979) the R&D personnel in China is distributed as follows:

engineers 36%
medical and health workers 30%
training and educational staff 20%,
science researchers 7%,
agricultural R&D workers 7%.

Only about 300,000 "researchers" are involved in science and technology in a strict sense of research work (i.e. conducting projects reported in the formal research literature or at least in "internal" reports). The total Chinese R&D effort is estimated at present to be less then 2% of the world total.

8. A forceful programme for manpower development is meant to increase the number of qualified research staff from 300,000 to about 800,000 by 1985. The situation of universities is now changing from an almost purely educational role to a combination of education and research. According to official statements, research institutions are supposed to make it possible for research staff to devote at least 5/6 of their time to research-related activities. Institutions involved in R&D, now about 2,000, are to be co-ordinated into a national system for effective use of expertise. International contacts and co-operation have developed at an accelerating rate since 1977.

9. The key planning and coordinating authority for non-military R&D is the State Scientific and Technological Commission. It was created in the late 1950's and operates at a ministerial level under the State Council. During the Cultural Revolution its functions were absorbed by the Chinese Academy of Sciences and it was re-established only in 1977, along with a network of scientific and technological commissions and lower-level committees in the provinces (reference 2). The State Commission directly controls three billion Yuan, of which one billion go to the Chinese Academy of Sciences (running about 110 research institutes and 4 universities) and 2 billion go to about 150 R&D institutions under the Ministry of Industries. The remaining R&D budget in science and technology is used for institutes in the provinces and for research activities in universities and other institutions of higher education (about 630 institutions with about 1 million students).

10. The organization of R&D shows tendencies both towards centralization and towards decentralization. The provincial commissions for science and technology are in principle subordinated both to the provincial counterpart of the State Council and to the (national) State Scientific and Technological Commission. There are clear signs of increased co-ordination and planning for a national science and technology programme. On the other hand the provincial authorities seem to have attained a relatively high level of autonomy, including research planning and organization (reference 2). This situation is of considerable importance in the case of a national programme for scientific and technological information and documentation, and tends to restrict the policy-forming and executive power of a national focal point to the role of co-ordinating efforts. In this context a key issue is the entitlement to establish and maintain international contacts and to obtain and dispose of foreign currency for acquisition of computers, literature and external information services. This is where ISTIC presumably will play a fundamental role.

Libraries and Information Services in Science and Technology

11. It was not possible during this mission to assess the volume of literature acquired directly by individual research institutions. The situation is largely determined by the limited funds of foreign currency and by the special position of the China National Publications Import Corporation (CNPIC, see paragraph 26). There is, as expected in any large research and development system, functional specialization of libraries and information and documentation services in different sectors like medicine, agriculture, science and technology (in the sense discussed earlier), and certain industrial areas. Until the present time the purchase of literature from abroad (i.e. excluding acquisition by exchange or gift) has been channelled through the China National Publications Import Corporation.

12. ISTIC has a national mandate to provide information and documentation services in science and technology, and is a dominant resource for literature excluding monographs. It is placed directly under the State Scientific and Technological Commission and is functionally, if not administratively, on the

top of a hierarchy including six regional and 29 provincial information and documentation centres of varying size and responsibility. ISTIC acquires a large number of research journals, patents, standards, handbooks, and special documents, e.g. conference proceedings. It also has a large collection of product information. At present, generally speaking, ISTIC does not acquire monographs.

13. Apart from ISTIC, the major libraries covering science and technology literature in Beijing are 1) the Chinese Academy of Sciences Library, 2) Beijing University Library, 3) Beijing (National) Library. Some details on these libraries are given here as a background to further considerations:

14. Within the administration of the Chinese Academy of Sciences there are about 140 institutional and seven regional libraries. The Chinese Academy of Sciences Library in Beijing has a staff of about 360. Its acquisition policy responds to the range of activities within the Academy research institutes, with dominance in pure and applied science including the life sciences, and less emphasis on technology in a strict sense. The cost of the Library's foreign acquisitions amounts to ¥ 800,000 for foreign periodicals (about 5,000 current titles) and ¥ 300,000 for monographs and other documents. The library offers plain-paper photocopy service from two new U-Bix 1500 machines (purchase cost about US$ 5,000 each) and two "Yan-Tse River" machines (approximately ¥ 18,000 each) made in China. The latter give quite good copies when in good trim but they are very slow (about 18 seconds for first copy) and quite expensive. The charge to users is ¥ 0.1/page. In addition there is a microfilm service using Zeiss (Jena) equipment. The present library building, which dates back to the 1950's, has a floor space of about 3,500 $m^2$ and about 30,000 m of shelving.

15. Since the Academy publishes a number of major research journals, a large number of foreign publications (including 1,500 current periodicals) are received on an exchange basis. About 1,500 titles are on open access. The library has about 20,000 registered users. On the average there are 600 readers/day. Home loans are permitted. Computerized library operations and services are at an experimental stage in co-operation with the Statistics

Institute of the Academy, using its French-Romanian computer, Felix 3512 (with 512 kB of core memory, 5 discs with 100 MB each and a present cost of ¥ 80/hour).[x)] Some co-operation or consultation seems to be underway on planning for computerization among the Academy of Sciences Library, the Beijing Library, and ISTIC. This concerns for example the design of the Chinese bibliographical format derived from the Library of Congress (USA) Marc II standard, and the subsequent development of a computer-based cataloguing system.

16. The Beijing University Library moved into a new building in 1975, with 25,500 $m^2$ space and 2,000 seats in 31 reading rooms. There are also departmental libraries, mainly with teaching materials. The University Library receives about 4,000 foreign journals of which some 2,500 are in science and technology. Exchange relations are established with 300 foreign institutions. The journals published by the Chinese Academy of Sciences are used as exchange material. There are interlibrary loan agreements with about 200 libraries in China, including of course the Beijing Library and the Library of the Chinese Academy of Sciences. Photocopy service is given using a U-Bix machine, with a charge of ¥ 0.1 for university staff and ¥ 0.2 for other users.

17. The university has a department of Library Science with a staff of 30, about 160 undergraduates and 10 postgraduates. There are courses in library automation and in information science. Some library automation and Chinese character processing studies are performed on the university's Chinese-built DJS-18 computer, which has four tape drives but no discs. The acquisition of a new computer has been considered by the Ministry of Education, but details of its purpose, type and planned location were not available.

18. It is interesting to note that the university also has a department of computer science and technology with a staff of 58, about 230 undergra-

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x) Throughout this report the abbreviation B will stand for a "byte" consisting of eight bits. A byte thus represents approximately one ordinary character, although this correspondence is not strictly true for all types of computer equipment mentioned in the report.

duates and 10 postgraduates. Specialities of research are: software engineering, computer architecture and micro-electronics. The university also has a research group for Chinese character information processing with a staff of 32. The following fields of research of this latter group are given priority:

"a. Computer systems for typesetting Chinese ideographs,
b. Laser typesetters and laser plate-making,
c. Chinese character intelligent terminals and related software,
d. Dedicated time-sharing operating systems and composition language compiler,
e. Photographic input, output and computer processing."
(Quoted from Beijing University Programme)

19. The Beijing (National) Library has grown out of the Metropolitan Library of Beijing (founded in 1910). The total area of the present building and four branch libraries is 40,000 $m^2$. A new building is in an advanced stage of design with an area of about 140,000 $m^2$. The scheme was approved as early as 1975 by the Government and the present plans were recently approved at the State Council and the amount of ¥ 66 million allocated (which corresponds to only ¥ 470/$m^2$).

20. The present staff number 860, and it is planned to double this within the next decade. About 9,000 individuals and 2,000 collective users are registered. The Beijing library is a depository library for all "formal" Chinese publications. The library also spends about ¥ 3 million annually on foreign acquisition, of which about 30% go to journal subscriptions (approximately 10,000 titles), about 80% of these being related to science and technology in a wide sense. The library may get special permission from 1981 on to acquire directly from abroad instead of using the normal channels through CNPIC (cf paragraphs 26-30).

21. The Beijing Library produces the Chinese National Bibliography which is printed in the library's own printing house. It also produces catalogue cards (see figure 1) for new Chinese books for over 2,000 libraries (almost 7 million cards in 1979). In co-operation with the Beijing branch of the China National Publications Import Corporation it also produces catalogue cards for all foreign books acquired by libraries in the Beijing area. An important innovation is the introduction of Pin Yin (the Chinese phonetic romanization) as a basis for ordering.

gāo yā jiàkōng shū diàn xiàn lù shī gōng jì shù shǒu cè
高压架空输电线路施工技术手册
架线工程部分

水利电力出版社 1977年12月
403页 大32开 精装 1.70元

本书介绍高压架空输电线路架线施工中各起重索具的受力分析，导线、避雷线张力和弛度的计算。主要叙述弛度测定与调整、施工过牵引、多档通紧、地面划印、飞车架线、索道引放线、低弛度紧线、预紧线等施工计算和耐张绝缘子串对弛度的影响计算等，并有不少计算线图，便于现场直接查用。

TM726.3-62 72.1831073 京科77-49-45
U357.044 〔73〕
1978年2月20日编印 15143·3260 78—0690

Figure 1. Catalogue card produced by the Beijing Library

The Beijing library has issued a printed Union Catalogue of Periodicals available in important libraries, giving details of each holding. This catalogue has not been brought up to date regularly. A 1978 edition of a list of 12,016 current titles issued by the China National Publications Import Corporation only provides purchased titles and not titles acquired by exchange.

22. The library has a photocopy service (two U-Bix and four "Yan-Tse River" photocopiers) and a microfilm service. One microfiche reader-printer (Japanese Vicon KO-1) and Chinese "Great Wall" microfiche readers (costing about ¥ 1,000 each) are available.

23. There is great awareness at the Beijing Library of the need for computer-assisted operations. Investigation, planning and experiments are going on. To begin with (in view of difficulties of Chinese character processing), efforts are being focused on "western" bibliographic material, in particular cataloguing and card production. An agreement has been reached among important libraries to use the AACR II (Anglo-American Cataloguing Rules. Second edition) with minor changes to suit Chinese practice. Experimental

runs are being performed on the Chinese Academy of Sciences (Statistics Institute) Felix 3512 computer. One short-term goal is to create a National Union Acquisition File. Participating institutions and libraries in the present experiment are the Beijing library, the People's University Library, the Chinese Academy of Sciences Library, the Beijing University Library, the Xin Hua University and the China National Publications Import Corporation. The idea of using the UNDP-provided Burroughs 6810 (see paragraphs 32-33) has been put forward but negotiations concerning access or rates have not yet been initiated. The idea of implementing a national cataloguing system similar to that of the Ohio College Library Centre (USA) has been discussed.

24. Among the urgent priorities in computer applications mentioned during the consultations at the Beijing Library are:

a. Operation of a Marc II-compatible in-house file of foreign acquisitions. Study trips to important centres in North America and Europe would be necessary but difficult to finance;

b. Periodicals control;

c. Library management applications.

25. The critical issue for many important computer applications being considered by the library is Chinese character processing. Examples of such applications are:

a. Special bibliographies of old collections,
b. The national bibliography,
c. Information on current research projects,
d. Management applications in general.

26. The China National Publications Import Corporation (CNPIC) was founded in 1949 but has its present name only since 1972. It has the assignment of control and management of all imports of printed materials, microforms, records, and tapes. Therefore, CNPIC has a unique position in the provision of information in that it is in charge of virtually all foreign currency available for acquisition of literature. It has a central office with a staff of about 600, and 28 provincial branch offices of varying size. An enormous

increase in foreign acquisitions has been made possible after 1979. A new building is now planned for the expanding central office of CNPIC. The central office compiles information on new publications, produces and disseminates catalogues and takes care of all external contacts. These contacts are organized in four business divisions:

a. Western and Northern Europe,
b. America and Oceania,
c. Asia and Africa,
d. USSR and Eastern Europe.

27. The monthly catalogues (four series) for these regions contain 600 to 700 titles/issue each. The catalogues are produced by off-set printing, largely using the publishers' own sales information, and sometimes including tables of contents and abstracts. Titles are translated into Chinese and the material is ordered in a rough UDC (Universal Decimal Classification) scheme. The catalogues and other publicity materials are printed in 5,000 copies and distributed to clients who may, however, also use other information when ordering. Orders are channelled through the CNPIC provincial branches and the corresponding material delivered to the ordering branch for further distribution. This means that, while the central office only keeps records on the items ordered and the ordering branch, the branches in principle have all information needed for compiling catalogues of various kinds - for example, a catalogue of current periodicals - although limited to purchased titles.

28. The administration costs of CNPIC and its branches are not recovered from the customer, who only pays the nominal price invoiced by the foreign suppliers. The figures quoted for library acquisition budgets should be seen in this perspective although, due to low-cost labour, this subsidy is not as important as it would be in most industrialized countries. Only recently (since 1979) has it become possible for CNPIC to order publications directly from the United States of America. Earlier this material was ordered through Western Europe (mainly the United Kingdom).

29. On the premises of the present central office there is a showroom with exhibition space for about 7,000 volumes. Sample copies of new books and other publications are sent by many publishers. These are on display for several months. About 30-40 visitors/day are received from libraries and research institutions in the whole country. A brief examination indicated that a very good sample of new books and journals is available, e.g. in the physical sciences and technology.

30. A new development was mentioned during discussions in the Beijing library, namely that this institution would be permitted to by-pass the otherwise very strict channelling of acquisitions and to obtain its own acquisition funds of foreign currency. This is expected to speed up delivery. It is, however, too early to know whether this will work out and what the long-term consequences would be for CNPIC.

Computer Resources in China and in Beijing

31. The development of Chinese computer industry has been reviewed recently (see reference 1). A first plant was set up in Beijing (Beijing Radio Wire Factory) in 1958. Since then many models of different capacity have been designed by computer technology institutions under the 4th Ministry of Machine Building, in the universities and in the Chinese Academy of Sciences. These models have sometimes been built only as prototypes, and sometimes have been produced in limited series. Models in production include series with the acronyms DJS, TQ, CJ, and HDS. Some of the models are compatible with (or even based on) foreign computers, like the minicomputers DJS 130 and DJS 131, which are related to the Data General (USA) Nova-1200 (which incidentally was superseded by the Nova-3 and Nova-4 series and was withdrawn before 1976). Observers seem to agree that the Chinese computer industry has suffered from a lack of:

a. co-ordination of design and production efforts,

b. consideration of users' needs in defining design characteristics, and

c. sufficiently well-developed and organized infrastructure for production of components and supplementary equipment, e.g., random access memories.

32. This situation implies a need for importation of computer hardware and systems know-how in many areas, and quite markedly so in the area of computerized information and documentation services. It may be of interest to note briefly some of the recent computer projects in Beijing:

a. Beijing Normal University is the site of a UNDP-assisted project (Modernization of Educational Methods, CPR/79/003) which has provided US$ 261,300 for purchase of a DEC PDP 11/44 system with a 1 MB ECC/MOS memory, two 67 MB discs, a magnetic tape unit, a fast line printer and 16 CRT terminals.

b. The Beijing Computer Centre (of Beijing Municipality) was founded in 1973. Until recently only one TQ16 computer was installed. In 1980 one Wang 2200 VS minicomputer was installed with 512 KB core memory, four disc units with 75 MB each, two tape units, 16 CRT terminals, three matrix printers, and one fast line printer.

c. The Information Processing and Training Centre for International Economic Co-operation, IPTCIEC (under the Commission for Economic Affairs) was created in 1979 from part of the Beijing Computer Centre, as a counterpart organization for the United Nations Development Programme (UNDP) computer project. The professional staff number 80, equally distributed among hardware and software specialists. A new building was planned in 1978 (before the UNDP project was finalized); construction started in November 1978 and was finished in May 1980. In August 1979 a document for a UNDP-assisted project (CPR/79/002) was signed, providing US$ 6.7 million for computer hardware, software and training programmes. Orders have been placed for about US$ 4 million of which US$ 2.5 million are allocated for Burroughs 6810 with peripheral equipment, US$ 0.1 million for a PCC XL 40 data entry unit, and about US$ 0.6 million for a Hewlett-Packard HP 3000 computer. Delivery of the B 6810 was expected by late 1980 (delayed due to licencing problems). For HP 3000 the licence had not yet been issued at the time of the mission.

33. An interesting feature is the training programme for hardware and software maintenance, included in the IPTCIEC project: For the B 6810, 25 qualified engineers have been sent to the United States of America for 12 months of training in 1979-80, i.e., prior to delivery. For the HP 3000, 8 persons were sent to the United States in June 1980 for 5-6 months.

34. Utilization of the machines is controlled by a contract with UNDP (apparently a condition for the licence, which excludes military applications). Every user organization and area has to be approved by a UNDP

policy committee. So far, 26 user organizations have been accepted, among which there is no research organization (no information is available as to whether applications from research organizations have been submitted). Examples of project areas are hospital management, and management applications in the Ministry of Commerce and in the Bureau of Food. The information centre of the Academy of Medical Sciences and the Beijing Library may be potential users in the information and documentation area - depending, it appears, on availability of funds.

35. IPTCIEC will operate on a non-profit basis. The B6810 will be run 24 hours per day, 5 days a week. The rate for computer time has not yet been fixed, but it might be in the order of ¥ 400/h. This is a low cost by "western" standards, but may seem high to users who are not accustomed to the cost of running a computer centre. In general, time-sharing on a fully utilized non-profit computer installation must be more economical than a non-fully-used dedicated machine, when all costs are taken into account. There may, however, often be practical considerations to bear in mind, for example, considerations concerning systems availability and expansion capacity; furthermore, the full costs of distributed use are not always brought out in the actual procedures of accounting. It should also be noted that the maintenance and operational costs will look different in China, due to the low cost of manpower. Such practical considerations may therefore favour dedicated installations on the basis of less strict constraints than in a "western" context.

The Role and Structure of the Institute of Scientific and Technical Information of China (ISTIC)

36. The preceding presentation of the environment in which ISTIC operates has been given as a background to the discussion of ISTIC's functions and developments in a short and medium-term perspective. A forerunner of ISTIC was founded in October 1956 by the Chinese Academy of Sciences (formerly Academia Sinica). It received special attention from the Government and in 1958 was given its present name and its formal status as a national centre. In 1960 it was transferred directly under the State Scientific and Technological Commission.

37. ISTIC now has a staff of about 1200 in its Beijing headquarters and about 500 in its Chongqing Branch. It is by many criteria one of the major information and documentation centres for science and technology in the world. It maintains an impressive collection of literature (periodicals, patents and other non-monographic texts as well as standards and trade literature) and offers a wide range of services including the publication of about thirty information bulletins and abstracting and indexing journals in its areas of responsibility. ISTIC is organized in a number of divisions related to different functions. Since production of information journals functionally overlaps with maintenance of special collections and services, the pattern of distribution of duties is rather complex. The brief list in the following paragraphs gives an indication of the scope and the relative size of the activities.

38. The units contributing to the library function include the following:

a. Acquisition department
Staff: 79 persons. Budget: ¥ 1 million per year. This department has responsibility for acquiring foreign journals (about 8000 current titles, of which 35% are in English, 19% in Russian, 14% in Japanese, 8.5% in German, and 3.5% in French; one third are obtained on exchange), proceedings, handbooks and other, mainly non-monographic, scientific and technological publications (about 30,000 items per year including all NTIS (National Technical Information Service, USA) reports on microfiche) as well as a large number of foreign product catalogues (about 50,000 items per year).

b. Library of foreign literature
Staff: 73 persons. This library handles periodicals control and library services in the area of foreign literature.

c. Library of domestic literature
Staff: 34 persons. This unit acquires Chinese scientific and technological journals (about 3,500 current titles) and provides corresponding library services. It also compiles retrieval publications such as two sections of the "Bibliography of Chinese Scientific and Technological Literature" and a "Catalogue of Chinese Scientific and Technological Literature".

d. Library of patents
Staff: 46 persons. Budget: about ¥ 1 million per year. The library subscribes to patent documents from fifteen countries including USA, UK, FRG, France, GDR, USSR, and Japan. About 700,000 items are received per year, and holdings dating back twelve years are kept in stacks in the Beijing headquarters. Compilation of "Catalogue of Patents" (reference I-11), and of popular reviews of patents is undertaken.

e. Library of standards
Staff: 60 persons. This unit is responsible for acquisition and registration of standardization documents from 50 countries. Library services are provided. Compilation of information publications concerned with standards (refs I-12 (a)-(d)) is also ensured.

f. Library of trade literature
Staff: 23 persons. This library is responsible for classification of the trade literature and for provision of a reading service.

The total utilization of ISTIC collections corresponds to about 125,000 visits per year, and production of about 4 million "direct" photocopy pages and about 2.6 million microfilm frames (a major part of these frames are also reproduced as paper copies, in addition to the figure of 4 million photocopies). No loans are permitted outside the building.

39. The reference function of ISTIC consists of the following:

a. Reference service
Staff: 32 persons. The reference service manages the reference literature collection. It provides reader services as well as "manual" documentation services, compilation of special bibliographies, and translation service (averaging 1.5 million words per month).

b. Analysis of foreign science and technology
Staff: 89 persons. Compilation and analysis is undertaken of information on foreign developments in technology in general, with special reference to industry and agriculture. A journal of "Trends in Foreign Science and Technology" (reference I-136(a)) is produced.

c. Information exchange on domestic science and technology
Staff: 62 persons. Compilation and analysis of information on domestic technical developments is ensured with special reference to industry, chemistry, agriculture and medicine.

40. The Publishing Division consists of the following units:

a. Scientific and technological press
Staff: 70 persons. This is a publishing house for journals and other documents produced by ISTIC alone or in co-operation with other organizations.

b. Printing house
Staff: 180 persons. It is responsible for printing of ISTIC publications and also takes on external work. For example, about 100 journals are printed. Total output in 1978 is stated as 200 million words of text, and a volume of 10 million copies.

c. China reproduction corporation for scientific and technological documents

Staff: 89 persons. This unit is responsible for reprographic service from printed documents. At present there are 13 electrostatic photocopiers (one OCE 1700, one U-BIX 750 and several Chinese-made "Yan-tse River" machines). 35 mm microfilm is produced with 10 units of the Zeiss-Jena type. A large part of the microfilm is reproduced as plain paper copies by 4 electrostatic copiers (2 Chinese copiers, model 330, and 2 British machines, models 12A, and 5BC).

41. Computer applications and systems developments are organized in a Division of Computer Services (computer centre) and a Division of Information Methodology, the latter created only in 1979.

The Division of Information Methodology has a staff of 14 persons. Its main tasks are in:

a. Standardization in documentation (terminology, bibliographic description, and record formats),

b. Chinese character processing (coding, computer processing and output/display), and

c. Analysis of information retrieval systems, and planning for ISTIC developments in the area of computer applications.

42. The Division of Computer Services has a staff of 50 persons. Its computer is a Japanese TK 70 minicomputer (Takachiho Koheki) built in 1970, with 64 kB of core memory, six disc units of 2.5 MB each and three tape units (800 bpi). The Chinese Character Printing System T 4100 (also Japanese and built in 1970) includes a font memory (for Chinese character generation) of 786 kB (metal oxide semi conductor, MOS) and a fast tape unit. A maximum of 6144 characters are stored as 32 x 32 matrices. Optical fibre transmission is used to transfer signals to an electrostatic printer for text production. Five keyboard terminals (one with a CRT screen) are employed for input using a shift-key technique (264 main keys, each representing 12 or 13 characters, which are identified by a selector (shift) key). The capacity of the keyboard is 3072 Chinese characters, Japanese Kana, Roman and Cyrillic alphabets, numerals and special symbols. Other characters can be accessed by 4-digit codes. Average input speed for a trained operator is reported to be 30 characters per minute. Main tasks of the division are:

a. Hardware and system maintenance, and training of computer technicians,

b. Development projects on information retrieval systems. (The computer configuration has too low a capacity for full-scale operations),

c. Development projects for establishment of Chinese bibliographic data bases and computer processing of ISTIC bibliographies of foreign literature (figure 2),

d. Experiments with machine translation from English to Chinese for journal article titles in selected areas (figure 3),

e. Creation of a Chinese thesaurus in science and technology.

TN011 0004
由矩形截面导电介质板组成的天线阵Ⅱ极化平面波的绕射
(Дифракция плоской Ⅱ-поляризованной волны на решетке из проводящих диэлектрических брусьев прямоугольного сечения) : Радиотехника. вып. 34. 1975. 3—9 (俄文)
(2032868)

TN014 0009
采用表面声波器件的变换加工
(Trdnsform processing using surface acoustic wave devices) : (IEEE int. symp. on circuits and systems. 地1976/4/27-29. Munich).

Figure 2. Examples of computer-controlled bibliographic printout

(0287) DISSOLUTION OF IRON AND IRON CARBIDE IN THE PEARLITE MATRIX #
(0287) 珠光体基体中铁和铁炭化物的溶解#
(0364) METAL WINNING FROM LOW — GRADE ORE BY BACTERIAL LEACHING #
(0364) 从细菌浸滤的低品位矿石中提炼的金属#
(0841) SOME MATERIALS RESEARCH IN NORWAY , SWEDEN AND FINLAND #
(0841) 挪威瑞典和芬兰的某些材料研究#

Figure 3. Example of machine translation

43. By its unique position in relation to the State Scientific and Technological Commission, ISTIC can play a key role in information and documentation service development in China. This is emphasized by the fact that the secretariats of the Chinese Society of Scientific and Technical Information (founded in 1978, with 26 provisional branches), and of the China National Technical Committee on Standardization in Documentation (corresponding to ISO TC 46, the technical committee dealing with documentation of the International Organization for Standardization) are placed in ISTIC's Division of Information Methodology. The Society's main objectives are to follow and contribute to developments in:

a. Machine translation,
b. Computerized information retrieval,
c. Chinese character processing,
d. Methods of information dissemination,
e. Applications of new technologies in providing scientific and technological information,
f. Methods of information analysis.

44. The relations among the present processes, products and services of ISTIC are described graphically in figure 4.

## III. ISTIC'S PLANNING FOR COMPUTER APPLICATIONS

45. For a number of reasons the development of computer applications in ISTIC's operations has been rather slow. As with many other scientific and technological institutions, the events in 1966 have implied changed policies and cutbacks. As a matter of fact the State Scientific and Technological Commission was dissolved at that time and ISTIC again placed under the Academy of Sciences. Most of the established reference publications were discontinued. Only in 1977 was the present organization re-established. The development of the Chinese computer industry has also been slower than expected. Various restrictions have made it difficult or impossible to purchase and maintain foreign computers at the level of present development. This situation is now rapidly changing, and ISTIC staff have made very far-reaching and detailed studies concerning computerization of ISTIC's operations within an integrated scheme.

46. Under this scheme (which is summarized in figure 5) the development of an integrated computer-based system at ISTIC is seen in terms of eight subsystems:

a. Information retrieval subsystem;
b. Computer-assisted compiling subsystem of secondary literature;
c. Thesaurus subsystem;
d. Acquisition subsystem;
e. Computer-assisted cataloguing subsystem;
f. Service subsystem;
g. On-going research and development projects subsystem;
h. Machine translation subsystem.

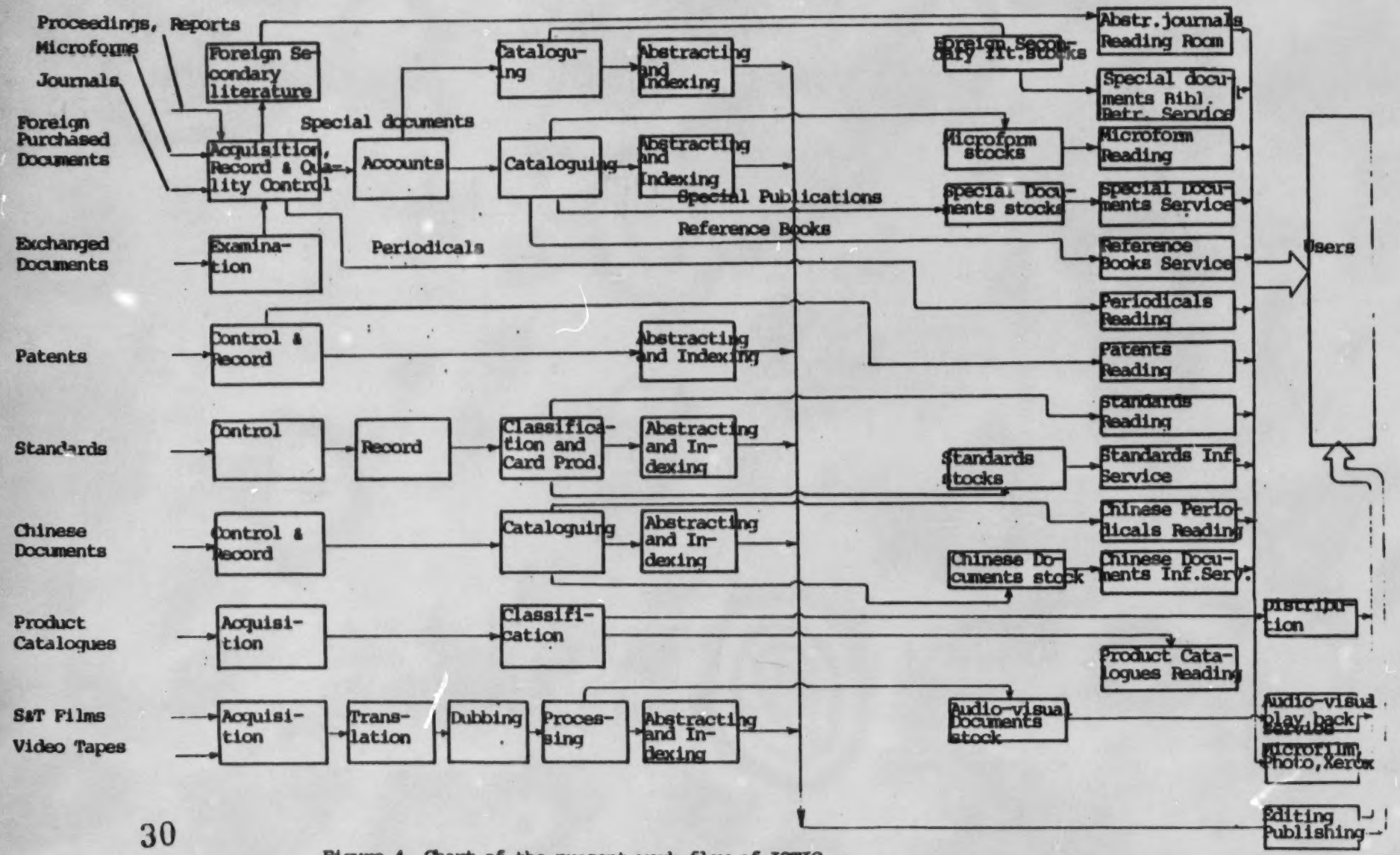
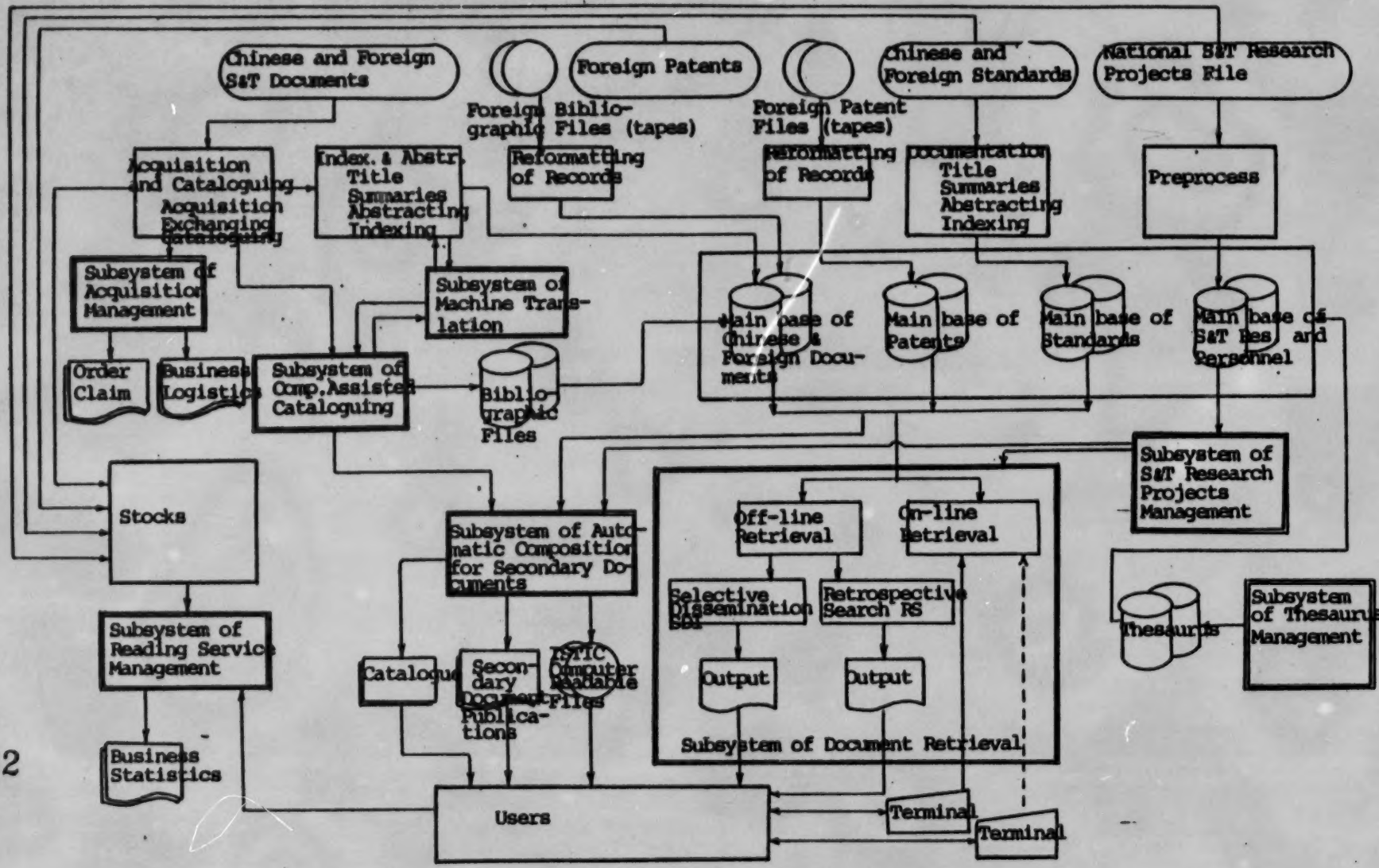



Figure 4. Chart of the present work flow of ISTIC




32

33

Figure 5. Chart of computer-assisted information systems of ISTIC

47. Developments are foreseen in a short range (1980-85) and a "long-range" (1986 onward) perspective (see reference I-3). The estimated needs for equipment for the first period include a central computer with 2 MB core memory, 30 disc units with 200 MB storage each, 11 magnetic tape units, 3 line printers, one Chinese character generator (6144 characters), 5 Chinese character input terminals, and 45 TTY terminals. Extensions for the next period mainly concern extension of CPU-capacity, addition of 10 tape units and increase of disc storage by 20,000 MB.

48. Considering the scope of activities required by the national mandate of ISTIC, the dimensioning of equipment seems to be reasonable. It can be viewed as comparable with the equipment for running major data base hosts in the industrialized countries (e.g., the Information Retrieval Service of the European Space Agency (ESA/IRS) or the Lockheed/DIALOG system in the United States). There are, however, two important technical problems remaining to be solved in the area of computer applications:

a. Handling of information in the form of Chinese character strings as appropriate within the different subsystems.
b. Provision of information retrieval services at the national level based on a wide coverage of the world's scientific and technological literature.

49. The present Chinese character processing capability at ISTIC is clearly too small to allow for computer handling of all material now processed for ISTIC publications (and therefore also for the build-up of Chinese language data bases for information retrieval). The necessary equipment for this purpose is not in fact immediately available for purchase. The rapid developments in Kanji processing that have taken place in the Japanese electronics industry over the last couple of years have made it technically possible to solve the design and operational problems associated with processing and computer retrieval of bibliographic records in Japanese (see Appendix 2). This, however, does not automatically solve the corresponding problems for records in Chinese although it offers a significant step towards a solution. A large number of difficulties, mainly conventions, standards and techniques for input of information and for retrieval, still have to be solved. Developing a Chinese information processing and retrieval system like that of the Japan

Information Centre of Science and Technology (JICST) (reference 16) is a project for several years, and is dependent on an acceptable solution to the basic problems of Chinese character processing.

50. Secondly, a large-scale on-line retrieval operation can be justified only if other components in the scientific and technological information provision system are simultaneously developed to a corresponding level of performance. This concerns, for example, the telecommunication network, the number of access points for on-line services, the size of the active information searching user community, library acquisition and back-up services, as well as a number of other factors relevant for the effectiveness of information and documentation systems. What could be implemented very rapidly in principle (i.e. given an adequate computer configuration and a selection of continuously updated foreign and international bibliographic data bases) is an SDI-service and perhaps a locally accessible on-line service on this material. Some analysis and recommendations will be given in chapters IV and V of this report.

51. Finally, it should be noted that ISTIC operates within a large science and technology system with many research institutions and information service organizations. There is a lot of co-operation underway, but the organizational structure for science and technology, with several ministries and regional or provincial administrations involved, will make it very difficult to achieve a completely coherent and co-ordinated development of computerized information and documentation services at the national level. Several independent library automation projects and project plans in Beijing have already been mentioned (paragraphs 15, 17, 23), and in discussions it has become obvious that many institutions in the scientific information field are involved in project planning and have arranged extended study visits to Japan, USA, and Western Europe. Such experience should be taken into account as appropriate in planning the computerized information and documentation system of ISTIC.

## IV. SOME COMPUTER HARDWARE AND SOFTWARE OPTIONS FOR BIBLIOGRAPHIC INFORMATION SERVICES

52. Bibliographic data bases are produced in many languages of which the most common is English. From the viewpoint of character processing the following groups of data bases are relevant:

a. Roman alphabet (especially English and French language data bases)
b. Cyrillic alphabet (especially Russian language data bases)
c. Japanese
d. Chinese (only at an experimental stage at present)

Since knowledge of Japanese and Russian is apparently relatively limited in China (and since the Russian-language tapes of the All-Union Institute of Scientific and Technical Information (VINITI) may not be readily available), it is reasonable to concentrate immediate efforts on implementing "western" data bases. It should be noted, however, that Japanese character data bases such as those of the Japan Information Centre of Science and Technology (JICST) might be of interest in China, perhaps using an information retrieval system such as JOIS II (see Appendix 2).

Selective Dissemination of Information (SDI)

53. For information systems of the scale considered by ISTIC, only a few operational software packages enable both interactive (retrospective) searches and selective dissemination of information (SDI). If SDI services are not run in conjunction with interactive searches, economy is best achieved by running in batch mode by means of specialized SDI software such as:

a. CAN/SDI (developed by the Canada Institute for Scientific and Technical Information, Ottawa). This package is made available free of charge to Member States under the auspices of Unesco (reference 9). It runs on IBM-compatible computers,

b. EPOS/VIRA (developed by the Royal Institute of Technology Library, Stockholm). The system operates on IBM-compatible computers and includes special routines for decentralized profile handling,

c. NERAC (developed by the New England Research Application Centre, University of Connecticut, under sponsorship of the National Aeronautics and Space Administration, USA). It is written in PL/I, and is apparently based on NASA/STIMS file maintenance subsystem.

54. The advantages of batch-mode SDI packages such as CAN/SDI, EPOS/VIRA and NERAC include the following:

a. Available free of charge or at modest cost.

b. Very good operational economy for SDI and easy handling both for documentalists and the computer service centre.

c. Possibility of carrying out retrospective search in batch (at least for small search volume).

d. Capability to search a large number of existing data bases (and to handle others by relatively minor programming efforts).

Typical limitations are:

a. The number of profiles allowed in each run is limited (to 2048 ($=2^{11}$) profiles per search run with EPOS/VIRA (present version). The present theoretical limit of about 10,000 profiles per search run with CAN/SDI is not really a restriction if efficient operations can be ensured at this limit.

b. These packages are designed for search in relatively short character strings (such as bibliographic records supplemented with keywords) and are not suitable for searches in, for example, abstracts or full text.

c. Portability may be a problem, e.g., EPOS/VIRA is written for maximum efficiency in IBM assembler, and the technical documentation is incomplete. CAN/SDI is written in PL/I, except for the search programme which is in IBM assembler for efficiency purposes, and complete documentation is available.

d. A large computer is required. For EPOS/VIRA an IBM 370/138 with 700 kB core memory represents the lower limit; CAN/SDI requires similar equipment and at least 150 kB core memory.

55. Detailed study will be required to see whether existing SDI packages would have to be modified to suit the ISTIC situation and whether they could be transferred to computers which, for appropriate reasons, are judged to be suitable for ISTIC. If any of these sytems is to be used to serve the entire

Chinese scientific and technological community, there will have to be multiple runs on some important data bases in order to accommodate the expected demand of profiles.

56. SDI services can also be run using interactive search systems. This is presently possible, for example, with the following software packages which are described in more detail in the next section:

a. NASA/RECON-related systems: Lockheed/DIALOG and IRS/QUEST,
b. NLM/Elhill-related systems: SDC /ORBIT and Elhill/BLAISE, Elhill/MED-LINE,
c. IBM/STAIRS-related systems: BRS and IAEA/AQUARIUS.

On-line Information Retrieval

57. For file management and interactive (normally retrospective) searches there are a limited number of well-established systems which are more complex and more demanding in terms of hardware than batch-mode SDI packages. Such systems include:

a. IRS/QUEST (developed from the NASA/RECON System of the National Aeronautics and Space Administration (USA) by the Information Retrieval Service of the European Space Agency). It runs on an ITEL-AS-5 computer (IBM-compatible);

b. Lockheed/DIALOG (developed from NASA/RECON by Lockheed Information System, Palo Alto, Ca., USA). It runs on certain IBM-compatible computers (e.g., IBM 370/165 and IBM 3032);

c. NLM/Elhill Medline services (developed by the National Library of Medicine (USA)) runs on IBM-compatible computers (e.g., IBM 370/158);

d. SDC/ORBIT (developed from NLM/Elhill by System Development Corporation, Santa Monica, Ca., USA) runs on certain IBM-compatible computers (e.g., Amdahl 470 V/5);

e. IBM/STAIRS, and modified versions, e.g., AQUARIUS (developed by the International Atomic Energy Agency (IAEA), Vienna) and the BRS (Bibliographic Retrieval Services Inc., New York) package.

f. CAN/OLE (developed by the Canada Institute for Scientific and Technical Information). It runs on certain IBM computers (e.g., IBM 3032).

g. Siemens/GOLEM. It runs on Siemens computers.

h. GRIPS/DIRS-3 (developed by the Deutsches Institut für Medizinische Dokumentation und Information, Frankfurt a.M.). It runs on Siemens 7555 computer with 11, 500 MB disc storage.

i. CDS/ISIS (developed by Unesco) runs on certain IBM and IBM-compatible computers including the Ryiad Series. Software, documentation and training are provided by Unesco free of charge. The package is regularly updated and improved, and is currently used by 53 institutions including 12 international organizations. A serious drawback which is presently being resolved is the limitation of file size to 100,000 records. (CDS/ISIS should not be equated with the original ISIS package developed in the early 1970's by the International Labour Organization, which is still widely used but now considerably less efficient and not truly interactive).

j. BASIS (developed by Battelle Research Laboratories, Columbus, Ohio, U.S.A.) has been installed in many computers in several countries. It runs on CDC-6000, Univac 1100, DEC 20, DEC VAX-11/780 and IBM 370 machines. The Infoline adaptation of BASIS (developed by Pergamon-Infoline Ltd. (U.K.)) runs on a Univac 1100;

There are also some relatively new packages for file management and interactive retrieval like:

k. MISTRAL (developed by Compagnie Internationale d'Informatique, sponsored by the Mission Interministérielle de l'Information Scientifique et Technique, MIDIST, formerly called BNIST). It runs on the French IRIS-80 computer;

l. 3RIP (developed by Paralog AB, Stockholm, sponsored by the Swedish Delegation for Information Provision). It runs on DEC-10 or DEC-20 computers;

m. JOIS, IDEAS/77, TOOL-IR have been developed (to some extent from other systems) by institutions in Japan to operate on Japanese Computer equipment (see Appendix 2). JOIS-II has Japanese character (Kanji) processing capability. It runs on a Hitac M-170. TOOL-IR runs on a Hitac M-200-H.

58. To give an example of the operational characteristics of one on-line information retrieval system, the IRS/QUEST system of the European Space Agency is now accessible simultaneously by a maximum of 137 terminals (this number depends on the structure of the network of nodes and the number of users at each node). Contracts for access have been signed with about 2000 user organizations in Europe, and service has been extended to Africa. The system is written for IBM-compatible computers and presently runs on an ITEL-AS-5 (model 3) with 3MB core memory. QUEST needs about

370 kB core memory. The external memory is 10,000 MB. Some 15 million records are stored, with a monthly increase of about 160,000 records.

59. The actual system cost - and cost recovery with present fees - should be investigated (in the perspective of ISTIC needs) for several on-line information retrieval systems to enable comparison. Since consideration should also include future needs of data bank processing, it is interesting to note that 3RIP and BASIS can handle both textual and numerical information.

60. In concluding the discussion of interactive file management and information retrieval systems, mention should be made of the recent developments in mini-computer applications. One interesting information retrieval system, MINISIS, has been developed by IDRC (International Development Research Centre, Ottawa) to handle intermediate-sized files on the Hewlett-Packard 3000. MINISIS is functionally compatible with the CDS/ISIS package of Unesco and can be made available under preferential conditions to developing countries. Apart from interactive retrieval it can perform functions like on-line input, acquisition processing, and index production. Up to 15 terminals can be handled simultaneously. The maximum external memory currently used is about 1000 MB. Other mini-computer packages of interest include the MILOR package (developed under sponsorship of the Mission Interministérielle de l'Information Scientifique et Technique (MIDIST) of France), which is written in FORTRAN and thus highly portable, and the DOMESTIC software (developed by the National Centre of Scientific and Technical Information of Israel and the company KTH-Informationssystem GmbH in Munich), which operates on the Digital Equipment Corporation PDP-11 series of computers. However, without prejudice to the power of mini-computer systems for many information and documentation applications, it can be considered that such systems are not presently appropriate for on-line information retrieval services (as opposed to SDI services, see paragraphs 69-70) of the scope ultimately required by the scientific and technological community in China.

Chinese Character Processing

61. Tremendous progress has been made in this field during the last few years in China and particularly in Kanji processing in Japan, as indicated briefly in Appendix 2 and the associated list of references. One major Japanese example is the JICST bibliographic files which are already produced and processed in many ways considered necessary for future ISTIC operations (input from CRT (cathode-ray tube) terminals, SDI and interactive search, computer-controlled production of abstract journals, etc). The problems of Chinese text include some further complications to those of Kanji processing, but present technology should in principle be sufficiently advanced to permit rapid development of acceptable solutions. In China a great amount of technical development has been accomplished, although this effort has apparently been dispersed among a large number of executing agencies. In addition to the experience of ISTIC and of other information centres described in Chapter II, one should mention, for example, the work of the Institute of Computer Technology of the Chinese Academy of Sciences and of the Shanghai Electrical Instruments Research Institute (see references 3 and 18).

## V. CONCLUSIONS ON INFORMATION AND DOCUMENTATION SERVICES

62. The preceding survey of the current situation and of possible solutions for computerization of information services leads to some strategic conclusions which in turn have provided the principal recommendations on the development of information and documentation services of ISTIC (Recommendations 1 - 9, Chapter I). These conclusions will be elaborated in the present chapter, and will focus particular attention on:

a. Factors affecting choice of a computer for ISTIC (including use of Chinese characters),

b. Problems related to SDI-services using external (Roman alphabet) bibliographic data bases, and to interactive information retrieval,

c. Problems related to the production and processing of national bibliographic data bases,

d. Computer-assisted acquisition, cataloguing and information management,

e. Some further activities in support of information and documentation services (machine translation, improved acquisition policies, reprography, training programmes, etc.).

Inevitably there is repetition of some specific items which are considered under different aspects of the problem.

A. Factors which Influence the Choice of a Computer System

63. The present ISTIC computer (TK 70) cannot handle the ambitious programme which has been set out. Although ISTIC might use the new Burroughs B6810 of the Information Processing and Training Centre for International Economic Co-operation (IPTCIEC) on a non-profit basis, this will only be a transitional solution for pilot projects and for services on a limited scale. Considering the size of the R&D system in China and the variety of services to be offered, a dedicated computer for information and documentation services is easily justified, in the longer term if not immediately. A number of known factors give guidance for the choice of an adequate computer configuration; however, a total picture must yet be formed, taking into consideration the requirements for the various ISTIC programmes and services and their inter-relations and cross-impacts.

64. The problem of Chinese character processing is of basic importance for ISTIC. Once general lines of action have been adopted, the hardware requirements and options in this area (e.g. Japanese, USA (e.g. IBM or Wang) or Chinese) should be reviewed and a selection made which is compatible with the hardware needed for the other functions of ISTIC. The Chinese character processing hardware envisaged includes terminals with special keyboards for input of material related to ISTIC's Abstracting and Indexing Journals, the data base on Chinese Science and Technology Literature, the database on Chinese R&D projects, and a Chinese thesaurus for scientific and technological terms. It also includes a font memory unit for the generation of Chinese characters (for computer-assisted type-setting and for on-line access to full text on CRT terminals) and fast printers of the laser-beam type. For on-line retrieval only, simpler CRT terminals (or even

matrix-printer terminals with Roman alphabet keyboard if Pin Yin-based retrieval is found practicable), and restricted character font memory (e.g. 6000 characters in 16 x 18 print matrix form), may turn out to be satisfactory (cf appendix 2, especially fig 17).

65. A large number of technical development projects are under way in China, Japan, Hong Kong, the United States, Australia and the United Kingdom. The Japanese techniques (reference 16 and appendix 2) do not easily accommodate a sufficient number of characters for the needs of Chinese language processing. Although problems of automated sorting and retrieval have been solved for Japanese needs (JICST, National Diet Library, etc.) the retrieval technique presents a major problem in transferring this experience to China. The Japanese method (via phonetic transcription into Kana) would have to be adapted, e.g., by using Pin Yin, which has fundamental consequences on systems design.

66. It is therefore recommended that a major critical review (evaluation) of the state-of-the-art be made, perhaps with the help of international funding. This would include study visits to the main centres of excellence in the field, analysis of the most promising ideas and results, and planning for the involvement of ISTIC in development of a satisfactory solution of on-line input and retrieval, file processing and computer-assisted printing. One such possibility is offered by the fact that recent Japanese computer equipment (Hitachi, Fujitsu and NEC) tends to be made to a large extent IBM-compatible. The extent of this compatibility should be investigated with a view to installing previously discussed SDI and interactive search software on such a computer or possibly combining Japanese Kanji processing equipment with certain other (e.g., other IBM-compatible) computers. Taking advantage of recent progress, pilot work towards Chinese text production and processing with satisfactory input devices and character repertory can be started as soon as a strategy for Chinese character processing is adopted by ISTIC and a coherent analysis of hardware needs is made.

67. Establishment of a national service of selective dissemination of information (SDI) is one of the priority recommendations of this report (Recommendation 5, explained in paragraphs 79-85) which in turn has considerable implications for the choice of computer hardware and software by ISTIC. The hardware requirements for such a service under different conditions should be investigated. Similarly, the different options for software (CAN/SDI, EPOS/VIRA, etc., as indicated in paragraphs 53-54 and the following remarks (paragraphs 68-70) should be investigated along with the implications of the software choice, both for the hardware requirements and for the problems of installation and maintenance of software. If, for example, a decision is taken to implement SDI services on "western" data bases immediately and at minimal cost, and to postpone full scale interactive search services until, say, about 1985, it is almost necessary to use one of the existing SDI systems and to use an IBM-compatible computer. If a package such as EPOS/VIRA or CAN/SDI were chosen and installed on an appropriate computer, a number of improvements could be made as the SDI service develops:

a. The number of profiles allowed for each run could be extended sufficiently to avoid multiple runs in a projected ultimate user group of about 15,000 scientists;

b. Search in both small and large records could be made possible;

c. The rules for definition of searchable Boolean expressions could be relaxed as appropriate to meet user needs.

68. In view of possible delays in choosing, financing and installing the ISTIC computer, the option of initiating SDI services on an existing large-scale computer or on a mini-computer should also be studied. In this way purchase of a dedicated computer for the entire ISTIC programme could also be postponed a couple of years until user needs have been developed by the introduction of SDI services and fully analysed. Possibly also the problem of Chinese character processing could be approached in a more satisfactory way given such a delay. The time requirements (and costs) of using the Burroughs B6810 of IPTCIEC for these preliminary operations should therefore be investigated within the overall task of choosing an ISTIC computer. If CAN/SDI or EPOS/VIRA were selected, the chosen package

would have to be rewritten for use on the B6810, and some of the improvements listed in the preceding paragraph could be incorporated at the same time. It would be preferable to employ one of the high-level languages available on both the B6810 and the ultimate ISTIC computer. The choice of such a language, e.g., PL/I, would be made with a view to facilitating programme maintenance and portability while maintaining reasonable operational efficiency. For good computer economy, runs could be done mainly at night.

69. It should also be noted that an SDI system with similar characteristics could also be implemented on a relatively inexpensive mini-computer, like the WANG VS-100. Programmes written in IBM assembler can be run on this computer so that large parts of the present EPOS/VIRA or CAN/SDI systems could be transferred directly. The programmes for file handling and terminal operations would have, however, to be rewritten, and the cost of necessary modifications in software and documentation would still be quite high. A more attractive alternative might be to design a new mini-computer SDI programme system, for example in PL/I or Pascal, for use on a machine such as a Wang computer or a VAX computer of comparable size (VAX is the name given to the most powerful models of the Digital Equipment Corporation PDP-11 series). The work involved here would be of the same magnitude as that expected in developing an SDI package for the Burroughs 6810. The design could be done so as to allow for maintenance and further development of the package at ISTIC.

70. The cost of developing a new SDI package for the Bourroughs 6810 or a mini-computer (or substantially rewriting and improving CAN/SDI or EPOS/VIRA) might be very roughly estimated at US$ 0.5 million, including development and implementation costs and staff training programmes for software maintenance. Purchase of an adequate new mini-computer for this purpose would add approximately US$ 1 million. As previously indicated (paragraph 60), acquisition of a dedicated mini-computer by ISTIC is not recommended if early implementation of large-scale interactive search services (and other complex operations such as Chinese character processing) is envisaged.

71. If it is decided that rapid implementation of interactive (retrospective) searches is required, it will be necessary to use one of the existing systems (paragraph 57). A detailed evaluation of systems design and operational properties should be made for the most interesting packages. Conditions under which these packages are available should also be investigated (negotiated). The on-line package selected should include facilities for large-scale SDI services if a specialized SDI package is not acquired. Obviously the requirements of disc storage capacity for interactive searching are much larger than for SDI only - up to 10,000 MB or more may be needed. As an example of information processing requirements, a project to create and maintain a file of ongoing R&D projects in science and technology (paragraph 88) may involve 100,000 records (depending in how R&D projects are delimited and defined). In the same way certain conditions are presented by the creation of a bibliographic file on Chinese scientific and technological literature (paragraph 89), which may, even with a rigorous selection of input, grow to 300,000 items within less then a decade. On-line services for a limited set of external data bases (e.g., patent files and major data bases like Chemical Abstracts Search), would involve processing perhaps 3 million records with associated inverted files.

72. Considerations of this kind will definitely affect the choice of an ISTIC computer. The hardware costs would depend on the volume of operations but would involve at least $ 1.5 million for an appropriate DEC-20 configuration, using the 3RIP system, to which must be added costs for training programmes. Presumably other comparable systems for interactive searches could be made operative at similar cost. This estimate foresees about 5000 MB of disc storage (similar to that already envisaged by ISTIC, see paragraph 47). The alternative of doing retrospective searches on foreign systems, interactively or otherwise, must also be investigated, taking into account the expected needs over the time period for development of the ISTIC system. If the initial needs are not too great, the introduction of full-scale capability to search external data bases might be postponed, at least for several years (cf paragraph 68).

73. Various computer applications in library management will not substantially influence the choice of hardware, since they only need a relatively small hardware capacity. Such applications include:

a. Production of a union catalogue (in cooperation with the Beijing Library) for science and technology journals in the main libraries (cf paragraphs 90-92),

b. Maintenance of a file of profiles for the SDI service (if not already included in the SDI package, cf paragraph 53),

c. Computerized control of periodicals for ISTIC,

d. A computerized system for acquisition of literature at ISTIC,

e. Computerized personnel and financial management for ISTIC.

74. The considerations of financing the eventual ISTIC computer and its operation must take into account three components:

a. Purchase of the initial computer configuration,

b. Training of systems personnel for maintenance of hardware and software,

c. Direct maintenance and operational costs (personnel and replacements of components).

75. Experience gained in the UNDP project at IPTCIEC (Burroughs B6810 and HP-3000) indicates that allocations for the training component should be in the order of 50% of component (a). Component (c), as a rule when maintenance is contracted out to the vendor's service organization, is expected to cost some 10% of the initial cost per year. In China, when equipment is maintained by the Institute's own staff, this component may be reduced, possibly by as much as 50%, considering the salary levels. This would imply an annual cost of 5% of the initial value, most of which has to be allocated as foreign currency so that components may be imported. Applications for external funds must take this problem into account. The analysis of staff requirements and training programmes performed for the Burroughs B6810 project will be of great help in estimating the corresponding needs for an ISTIC computer centre.

76. To arrive at a long-range strategy for building up computer power at ISTIC, an overall picture should be developed taking account of the different points already raised and the outcome of the various investigations which have been suggested. With this overall picture in view, a decision has to be made on the programmes for computer-assisted information and documentation services and other activities at ISTIC, with due regard for user needs and available alternatives. The outcome will be a preferred configuration for an ISTIC computer (and possibly an earlier preliminary solution for certain priority services such as SDI) which can then be considered by appropriate funding agencies such as the United Nations Development Programme or the United Nations Interim Fund for Science and Technology for Development.

77. The preceding discussions have shown that two distinct technical problems will be most important in determining the final choice of an ISTIC computer: the strategy to be adopted for Chinese character processing and the strategy for handling major external (Roman alphabet) bibliographic data bases. Although these problems must be considered separately, there is every reason to believe that a common computer configuration can serve both lines of action with a view to subsequent integration of operations.

78. Considering the present size of the R&D system in China, the resources of scientific and technological libraries and information centres and the state of telecommunications, a large-scale programme of SDI (current awareness) services employing major external data bases is easily justified. This programme has to be combined with a back-up system providing the full text of retrieved titles, in most cases in the form of photocopies. On the other hand, in the near and intermediate future it is possible that the R&D system will not be able to support the costs of a large domestic operation of on-line bibliographic searches. If large-scale interactive retrieval is to be initiated by the mid-1980's, a computer configuration such as that already considered by ISTIC (paragraph 47) is entirely justified, assuming that the problems of Chinese character processing and software compatibility are fully taken into account. If, however, computerized information and documentation services are to be essentially limited during the expected life of the computer system (the period up to approximately 1990) to SDI, to production and exploitation

of national data bases, and to computer-assisted management and coordination of information services, a powerful mini-computer configuration (such as those discussed in paragraphs 60 and 69) or a shared computer could also be considered, subject to resolution of the problems of Chinese character processing and software compatibility.

B. Information Retrieval from External Data Bases

B.1 Establishment of a Computerized SDI Service

79. An SDI service for up to 15,000 users should be set up, offering searches in about twenty databases in science and technology (approximately ten major data bases plus several highly specialized data bases for particular needs), implying the processing of some 60,000 profiles and some 2 million bibliographic records per year, based on normal working assumptions. Furthermore, SDI services should be tried for patents, which would add another 0.5 million records per year. Assuming a total population of 600,000 researchers in China (paragraph 8) this approach would ensure services to an essential group of about 2.5%. In each of the 2,000 advanced research institutions only 7-8 current awareness queries on the average could be handled, i.e. less then one for each research "project". Even so, the SDI systems available, e.g., CAN/SDI or EPOS/VIRA, are not conceived for an operation of this size so that multiple runs will be necessary for intensively used databases.

80. A staff of some 75 documentalists (with a background in science and technology) will be needed for the build-up of a user community, promotion of services, user education and maintenance of profiles in cooperation with the users. A decentralization of profile handling and user contacts should be envisaged, so that major science and technology libraries in the provinces take on part of the responsibilities for the system. A software group of 3-4 programmers will be needed for system maintenance and development, even if an existing SDI package can be used.

81. Several documentalists with experience in "manual" reference work and an appropriate subject speciality in science and technology should be sent for on-the-job training at a centre using the software selected for installation or providing a similar service. Training should include profile construction on all data bases considered, management of user contacts, dissemination of output, organization of back-up photocopy service, promotion of services and organization of user training programmes. Educational tools for introducing SDI services have to be produced, and the experience of established systems could be helpful. Possibly, at a later stage, one might work with computer-assisted instruction. Training programmes are needed both for users at various levels (undergraduates, post-graduates, scientists and engineers, etc.) and information professionals (librarians, library assistants, documentalists) who are to take part in the decentralized operation of the system.

82. An inter-library service system for providing the full text of documents retrieved in SDI services should be organized. Libraries should agree on an SDI computer printout format which would serve directly as a bibliographic description for loans and photocopy requests. The SDI subscriber could then use appropriate items on his computer listings directly.

83. Users should normally request materials through their institutional libraries (those within universities, industrial enterprises or research laboratories) where the easiest way to satisfy each request would be found. For this purpose it is important that an up-to-date union catalogue be available for foreign science and technology journals, within an inter-library loan system. A project to develop such a catalogue for several hundred libraries is presently managed by the Beijing Library. To ensure continuous updating and frequent publication it may be advisable to create a joint project with ISTIC for computerized production of the catalogue (see paragraph 91).

84. A simple procedure for payment of photocopies should be introduced so that costly and time-consuming administration is avoided. One possibility is to introduce institutional accounts in the main libraries responsible for services to a region. Payments are then made in advance to cover the institution's expected requests for copies during a six-month period and each delivery is simply noted on the account.

85. Evaluation of SDI services and educational programmes should be carried out regularly to give guidance for improvements. Likewise, international developments have to be followed, so that new data bases can be introduced and long-term service development can be planned.

B.2. Study and Development of a Chinese On-line Information Retrieval System

86. Detailed studies should be performed on the technical features (hardware, software), administration, network organization, telecommunications use and economies of major existing on-line bibliographic retrieval services. The objective is to explore the possibility of using an existing system package in China or, alternatively, whether efforts should be spent on designing a new one. It is important to estimate the true costs of each system, with a breakdown into budget components, in order to assess its relevance to the situation in China. The projected development and structure of user needs for on-line services in China should also be studied.

A list of required data bases in order of priority, with indication of the disc storage volume envisaged for each (depending on the annual volume and the desired time coverage), should be prepared and can form part of the specifications for an ISTIC computer. The present analysis of computer specifications, ref I-3, does not provide this kind of information.

87. Once a decision on an ISTIC computer has been made and funds provided, preparations for local on-line services can be undertaken to the extent judged reasonable and technically possible at the time. Simultanously, experiments can be undertaken on use of existing external services, both by telecommunication links and correspondence. The development of SDI services will naturally raise awareness in China of the usefulness of retrospective searches, as will the several pilot computerization applications recommended in the following sections. As a result of these developments and the general growth of the R&D system, the pattern of needs will change rapidly.

## C. Creation of National Data Bases

### C.1. Computerized R&D Project (and Sub-Project) File

88. The creation and maintenance of a computerized R&D project (and sub-project) file is an essential task. Such a file will be useful for referral (an ISTIC duty in its capacity as a national information centre) and as an aid to the State Scientific and Technological Commission for the definition of science policy and the co-ordination of resources. Referral is the process of establishing contacts between a person in need of expert consultation and the experts or institutions active in the particular field in the country (or abroad). One widely-known national effort in listing on-going research projects is that of the Smithsonian Science Information Exchange (Washington, D.C., USA). A great deal of work on standardization and organization of files of R&D projects in progress has been done by Unesco (references 10-13). Software for the creation of the file, for maintenance and for retrieval should be implanted, either using available software (standard file handling software of the computer to be employed or another available package such as CDS/ISIS of Unesco), or by development of new specialized software. The number of staff needed will depend on the extent to which the compilation and updating work on the file can be decentralized. The existing administrative structure, with its provincial commissions for science and technology, seems to be the natural starting point for agreements on shared responsibilities.

### C.2. Bibliographic Data Base of Chinese Science and Technology Literature

89. A considerable proportion of Chinese R&D results is reported in the Chinese language. Some 4,000 science and technology journals are published at present, with differing readership profiles, circulation and levels of presentation. It is difficult to estimate how much of this represents original R&D contributions, but obviously only a small fraction of these contributions is entered into the international abstract journals and tape services. However, the usefulness of a bibliographic instrument giving access to indigenous R&D results must be judged according to somewhat wider criteria

than those relevant at the international level. It would seem natural to create a data base for Chinese R&D literature covering some 40-50,000 items/year (with appropriate quality criteria for selection) at the present level of the R&D system. The aim would be to make the cumulative file accessible for on-line search as one of the pilot projects of ISTIC. Like most of the projects related to indigenous inputs of information, a key issue is the solution of the problem of Chinese character processing. There are different ways to avoid this difficulty, e.g., translating the titles and abstracts of journal articles or using Pin Yin consistently. Perhaps the important R&D journals might be persuaded to introduce an obligatory English title and abstract, which would make it possible to produce a database of international interest.

D. Computer-assisted Acquisition Control, Cataloguing and Library Management

90. A number of services for administrative purposes (preferably on-line) have been mentioned earlier (paragraph 73). These are less demanding with respect to computer requirements and should not cause any technical problems once the computer configuration is determined. In addition to standard software for file handling, some special software will probably be available for immediate implementation, e.g., for periodicals control (packages for certain functions are already available and comprehensive packages are now being developed in various places) and for production of union catalogues - at least for Roman alphabet processing.

91. Preparation of a union catalogue of current foreign science and technology journals is a particularly important priority. The Beijing Library (National Library) has a long-standing commitment to produce a union catalogue of the holdings of a large number of participating libraries. This is a major step towards preparing a comprehensive union catalogue and is a more difficult task than to maintain only a list of currently received titles. The Beijing Library catalogue has not been published regularly (the latest issue seen by the consultants was a supplement for 1964). CNPIC has also issued a list of journals to which Chinese libraries subscribe (1978), but this does not include

titles obtained as gifts or as exchange and only covers the area of distribution through the Beijing branch ("Foreign Bookstore"). It thus seems advisable to create a joint project between the Beijing Library and ISTIC (using initially, although not in interactive mode, the ISTIC TK 70 computer) in order to produce a computer-based file for regular updating and printing. The equipment for input and output would permit the processing of Cyrillic and Japanese titles in their original form. Chinese translations of titles might be provided with a restricted character set. Furthermore, subject lists and lists for each participating library could be produced automatically. At a later stage the whole process would be transferred to new, more powerful equipment.

92. Another interesting opportunity arises from the centralized acquisition of publications through CNPIC. Since every Provincial Branch of CNPIC has records of the distribution of all subscriptions to foreign periodicals, it would be possible to obtain a basis for union catalogues of current periodicals for each province. This would only need to be supplemented by information on additional acquisitions of each library by exchange or as gifts. The task would be considerable, but could be greatly facilitated by computer processing since a large part of the core journal titles would not have to be keyed in again, but could be obtained from the Beijing area file.

## E. Some Further ISTIC Activities

### E.1. English-Chinese Computer Translation

93. ISTIC provided the consultants with a practical demonstration of its work in this field by translating a sample of journal article titles, within the limits imposed by the character set of the present computer and by the scope of the project (vocabulary, linguistic analysis). No report has yet been prepared for the project. It is recommended that the project be concluded by the publication and international dissemination of a research report, dealing with the problem of machine translation. Furthermore, a critical review of the state-of-the-art on machine translation should be performed as a follow-up project, with the objective of establishing contacts with other groups, and

working out a plan for ISTIC's further involvement in this area. (It may, for example, possibly be more effective to design an on-line system in support of traditional technical translation, e.g., in the form of a thesaurus giving synonyms and hierarchical relationships, which would also be useful for classification work).

E.2. The ISTIC Book Collection

94. It appears that the present acquisition policy of ISTIC with respect to research publications is basically oriented towards material needed for the effective use of the patents and standards literature. This explains, for example, the considerable collections in areas of interface with science and technology such as the agriculture, medicine, and pharmacology. In principle, within the general scope of the ISTIC collections heavy emphasis is laid on the acquisition of periodicals, whereas very limited importance is attached to the acquisition of "books". Exceptions to this limitation are conference proceedings, handbooks and other reference literature. Readers are supposed to find scientific and technological monographs in the major Beijing libraries (the Beijing Library, Beijing University Library, and the library of the Chinese Academy of Sciences). It can be argued, however, that the monograph literature is at least as important for understanding the principles employed in patents as is the journal literature.

95. In fact, many of the users of patent literature and of other technological documentation are not expected to have an advanced educational background in science and technology. They very often need not only the monograph literature where established results are presented in an integrated form and in perspective, but also more basic texts, like college textbooks in various theoretical and applied areas. Simultaneous access to this material along with the main collections (patents, standards and journals) would therefore provide a considerable improvement in service to the users. It is strongly recommended that a good collection of monographs be included in the acquisition policy of ISTIC. It is estimated that 5% of the present acquisition budget would be sufficient to achieve this objective.

E.3. Photocopying and micrography

96. The preceding sections have demonstrated that provision of actual documents should be considered as an integral part of computerized information services at ISTIC and have shown that demand for document delivery is likely to increase dramatically in the future. ISTIC already has a large and effective organization for photocopying and microfilming. Some of the equipment is however relatively inefficient and will have to be replaced within a couple of years by modern machines. If a considerably improved version of the Chinese-built "Yan-tse River" plain paper copier is brought out on the market, this would be a satisfactory solution. Otherwise Japanese equipment (e.g., U-BIX or Canon) are now marketed in Beijing. Quite recently Xerox also has become available.

97. Furthermore, flexible equipment for the production of microfiches and diazo-copies of microfiches is needed. The cost of such equipment is relatively small compared to the acquisition budget of ISTIC. Since this service is also of great importance for the regional network to be set up for East and South-East Asia (see below), it might be possible to find contributions from international funds.

E.4. Training Programmes

98. The introduction of computerized information services and operations at ISTIC necessarily requires new types of professionals with knowledge of the hardware and systems software for the computer, the applications software and the practical aspects of providing new services to users. A number of parallel education and training programmes for staff will be needed, part of which can be implemented without reference to final decisions on the ISTIC computer configuration. It is therefore recommended that ISTIC immediately start work to establish a training programme for information professionals relying as appropriate on invited teachers from abroad and on foreign training during the initial period. Extensive use of the conference centre in the new ISTIC building can be foreseen for training activities.

99. Examples of useful external training are courses in acknowledged centres for education in library and information science, like those at the University of Wales (Aberystwyth), the University of Sheffield (UK) and Case Western Reserve University (Cleveland, USA). Other types of training can be obtained by extended visits (on-the-job training) to established information and documentation centres, such as the Canada Institute for Scientific and Technical Information (Ottawa), the Royal Institute of Technology Library (Stockholm) and the Documentation centre of the Centre National de la Recherche Scientifique (Paris).

100. It is also recommended that ISTIC, in the light of its own development and as the coordinating centre for information and documentation services in science and technology in China, should be given responsibility to promote and maintain the various functions, such as training, which are suggested for the development of a Regional Network for Scientific and Technological Information in East and South-East Asia, and that support for implementation of regional training activities be sought within the network project.

## VI. THE ARCHITECTURAL BRIEF FOR THE ISTIC BUILDING

101. The Office of Building Projects of ISTIC prepared a highly detailed brief for the new building. This consisted of a schedule of areas for the various departments and included the size of individual rooms. The list was annotated to show any special requirements such as the need for air conditioning or the occurence of exceptional floor loading. In addition, various diagrams analysed flow patterns within the building and organizational relationships. This brief had formed the basis of four different designs produced by the Institute of Architectural Design in the recent past. These sketch plans, elevations and sections showed somewhat differing approaches to organization of the building volumes on the site.

102. The site which had been selected for the new building is close to the intersection of Chang An Street and West San Huan Road. Chang An Street is the principal east-west road of Beijing passing through Tianmen Square, the centre of the city. The site is on the western extens[illegible]f this boulevard,

just beyond the existing Military Museum. Its immediate neighbour is to be a new Colour Television Centre which is being planned. The new underground railway line runs along this east-west axis. The site is thus readily accessible by public transport and is certainly much more central than the present location of the Institute. It is of a considerable size and will, in addition to the buildings of the Institute itself, contain housing for about a third of the staff. The proposals in this report, however, only deal with those spaces which are immediately related to the functioning of the Institute.

103. The building brief for ISTIC can be divided into three major groups of facilities:

a. the information centre with its associated computer and administrative services;

b. a conference centre, also to be used for teaching purposes and the presentation of films and other audio-visual performances;

c. a publishing department for scientific and technical documents.

Each of these groups has in a sense an independent existence though all are closely related and benefit from being next to each other on a single site. The planning of the three components must take this need for proximity into account.

104. The net usable areas (the areas required for various functions excluding corridors, lavatories, service areas, etc.) of the three groups are as follows:

| | |
|---|---|
| a. Information centre | 29,424 |
| b. Conference centre | 3,320 |
| c. Publishing department | 2,390 |
| | 35,134 $m^2$ |

The total gross area which has been assumed for the building is 56,200 $m^2$ and the current budget is based on this figure. Any planning arrangement which maintains the net area but reduces the gross area would thus be of some advantage.

105. The major group of facilities, i.e., the information centre, can be further subdivided into library spaces for readers and material on open access shelves on the one hand, and service zones such as closed access stacks, administration and computer services on the other. The net floor areas of the main sub-divisions are as follows:

| | | |
|---|---|---|
| a. journals | 3,759 | |
| b. patents | 3,418 | |
| c. trade literature | 1,726 | |
| d. standards | 758 | |
| e. bibliographic references | 1,500 | |
| f. associated reader services | 900 | |
| | | 12,061 $m^2$ |
| Staff and Service areas: | | |
| g. stack | 8,660 | |
| h. microform storage | 700 | |
| i. computer and associated offices | 2,858 | |
| j. acquisition, cataloguing, indexing and abstracting | 1,718 | |
| k. administration, research, translation | 3,427 | |
| | | 17,363 $m^2$ |
| | TOTAL: | 29,424 $m^2$ |

106. These figures were analysed during the present mission and related to the provision of shelving and reader spaces. It was thought desirable that journals and patents should remain on open access shelves as long as possible and certainly in the case of journals, if at all feasible, for five years. it was therefore suggested that the area of closed access stack be reduced and the areas allocated to journals and patents correspondingly increased.

107. The proposal which had been evolved by the Institute of Architectural Design consisted of a four-storey building containing the reader areas with a stack of the same height attached to it, and beyond it, a four-storey computer centre. This low building group was linked to the conference centre and to a 12-storey slab block containing administration, research, translation and the publication department. It was this design which was modified during the mission in Beijing in order to develop the drawings which are part of this report (figures 7-15). The principal change consisted in enlarging the floor area of the four-storey building and substituting the slab block by an additional floor on top of the low building. The reasons for these changes are set out in the next chapter.

## VII. BUILDING DESIGN PROBLEMS

108. Extensive discussions were conducted with members of the Institute concerning a number of problems which had immediate bearing on the design of the building. These discussions were based on the specific notions adopted by the Institute on the basis of the particular services which it supplied, as well as on a more general awareness by the present consultants of typical issues which arise in the use of information centres. As a result of this dialogue, a number of points emerged which it is believed are crucial to the design of the new building. These are listed and described in this section and are then related to the revised plans which are illustrated in the subsequent chapter.

109. In all library and information centre planning, there is likely to be a high degree of uncertainty as regards future usage. In particular, ratios between closed and open access areas may vary considerably as well as the relative areas allocated to different documents as, for example, journals and patents. It is important therefore that planning should not be too specific on the basis of a current brief but rather allow for major variations in the future. What can be established with some degree of assurance is that there is likely to be a need for two characteristic areas: one for readers, needing good lighting and preferably a view, and the other, having a lesser need for permanent high levels of illumination, in which books can be stored and in which microform reading devices can be placed.

110. The information sources of the centre (in the form of material stored on shelves, in microform or in the computer) are likely to be used by both readers and many members of the staff. In particular, staff dealing with translation and with information analysis will require frequent access. It is thus highly advisable that the building should be as compact as possible in order to reduce the travel distances for those moving within it. A compact building is also likely to reduce the proportion of circulation spaces - corridors, staircases, lifts - and, as a result, show a reduction in the gross area. It is also probable that a compact building can be so designed as to have an advantageous ratio between floor area and external surface; in other words, it should be possible to minimize external walls which cause heat losses in the winter and heat gains in the summer.

111. A number of zones of the building are designated to be fully air-conditioned as part of the initial building programme; other areas may be air-conditioned later. The main areas which will have a controlled environment at the outset are the computer centre, storage rooms for microform material, spaces for reproduction services, the telephone exchange and a small number of other associated rooms. There would be a considerable advantage regarding duct runs if all these spaces could be closely related to each other and if this group of spaces could be shielded from solar gain as much as possible. This would provide a saving in both capital expenditure and running costs.

112. The climatic conditions in Beijing suggest that comfort within a building will be considerably increased in the summer if solar heat gains can be reduced. These gains come from both direct sunlight as well as from diffuse radiation emitted by a thin layer of haze or cloud which produces the frequent typical overcast skies. It is essential, of course, that shading devices should not obscure the winter sun which is of great benefit and reduces the need for heating.

113. In the future the whole of the building may be air-conditioned. This makes it even more crucial that shading devices be provided in order to reduce the energy demands of the system. It is also important that any future air-conditioning installation should not disrupt the operation of the Institute

more than necessary, and that the space demand of the air-conditioning ducts should neither significantly reduce areas already being used nor cause the building to be designed with a great deal of spare capacity which may never be required.

114. The new building for the Institute on the main east-west road of the city will be one in a sequence of buildings of national significance. It is important that its visual impact should be related to this position. It is most unlikely that it can make an impact through height because any vertical effect is certain to be dwarfed and made ineffective by the adjacent Colour Television Centre more than 30 storeys high. In any case, a vertical arrangement is likely to be functionally inefficient and thus undesirable. The effect of the building must therefore come from its broad horizontal mass and the detailed treatment of its exterior.

## VIII. DESIGN PROPOSALS FOR THE BUILDING

115. The design which was developed during the mission in Beijing is shown on Drawings 1 - 9 which are part of this report (figures 7-15). The original plans are at a scale of 1:300.

116. Drawing 1 (figure 7) shows in diagrammatic form the organization on the site of the three principal groups of facilities of ISTIC and of the external circulation pattern. It will be seen that readers have access from the main road on the south, and that staff and goods enter on the north from a side road which will be constructed on the eastern boundary. Staff housing and the Institute's dining hall are also to the north. Both the Conference Centre and the Publishing Division are on the east side and can be reached independently from the new eastern boundary road.

117. Drawing 2 (figure 8) is a plan of the lowest level. The entire floor is given over to stack and the mechanical plant room for the air-conditioning system, both present and future. The space not needed at the moment can, of course, be used for storage. The closed access stacks have been placed on this lower ground floor so that compact storage can be used, if this should ever be necessary, without the need for a heavy and costly structure at upper levels.

118. The floor-to-floor height is slightly increased in comparison with a normal floor to allow for the main horizontal distribution of future air-conditioning ducts on the ceiling. This then permits the installation of smaller vertical ducts feeding the upper floors. These are likely to minimize the need for space, and, particularly, for difficult crossovers on the upper floors. If the lower floor remains a closed access stack there is also no need to obscure these ducts by a false ceiling. It will be seen, however, that the plan of this floor follows the typical layout and that it can, therefore, be arranged like an upper floor in the normal way for open access use, with readers around the perimeter and around the courtyard and with books in the areas between these two window zones.

119. Drawing 3 (figure 9) gives the plan at entry level. The pattern of entry and of movement is as shown on the schematic plan of Drawing 1 (figure 7). Immediately to the right of the entrance is a long gallery space which leads to the conference centre. Along this route are placed an information desk, a depository for coats and bags, lavatories, a room containing an audio-visual presentation of the workings of ISTIC and the bookshop of the Publishing Division.

120. Ahead of the reader entrance is a control point and the staircase leading to the two upper floors open to readers. There should, thus, be no need for the use of the lift except by the old and disabled. The staircase is designed in such a way that the principal three floors of the building are visible at once from the point of entry.

121. The two reader areas on this floor are placed on the west side and contain trade literature and the library of standards. The east side is a staff working area reached from the north entrance and linked to the entrance for delivery of material which is also on the north side. This work area deals with acquisition, cataloguing, indexing and abstracting, and forms a continuous work floor from the delivery bay to the book lift at the centre of the building.

122. Running north-south alongside the staff entrance and reached from the staff corridor is the air-conditioned zone which is given over primarily to the computer centre, to reprographic services and, on the entry level, to the storage of samples (specimens) in order to reduce the amount of cleaning which these might otherwise need.

123. To the east of the main building, and reachable from both the reader and staff entrances, is the conference centre. This consists of three auditoria and associated class rooms, meeting rooms and service spaces. The largest auditorium seats 600 people and has a raked floor. The medium size hall seats 300 people and also has a slightly raked floor. The smallest hall has a flat floor and seats 150; different arrangements of the seating are possible. The three principal conference spaces can all be entered separately from a paved courtyard but their individual foyer spaces are linked so that during large conferences the centre can function as a single unit. Most of the meeting rooms and seminar rooms are at entry level and lower ground level and face a planted courtyard with a water garden which lies between the conference area and the main building.

124. Drawing 4 (figure 10) is the plan of the second floor. The reader area houses the bibliographic reference section at the centre and the various collections of journals in the four zones centred around the courtyards. Part of the plan has been drawn showing a typical layout of tables, shelves, microform readers and computer terminals. It will be seen that the east and west sides of the building have projecting rooms placed along their lengths. These have solid walls facing east and west in order to obscure the low sun and windows on their north and south faces. These rooms can be used for discussions or seminars or can be subdivided to become individual study spaces or offices for documentalists. The plan also shows the offices of the Publishing Division and the upper part of the conference centre.

125. Drawing 5 (figure 11) gives the layout of the third floor which houses the collection of patents. The detailed arrangement of furniture would be very similar to that shown on Drawing 4 (figure 10). This floor, like the second floor, has a readers' room on the south side with a balcony overlooking the entrance. Here readers can smoke or look at newspapers.

126. Drawing 6 (figure 12) shows the top floor. This consists of offices and meeting rooms used by the administration, the translation and research departments and the division dealing with the exchange of scientific and technological information within China. The air-conditioned zone houses the telephone exchange and its service spaces, the broadcasting room, a meeting room which can be darkened for showing slides or films and a number of storage spaces. The offices are arranged around courtyards and roof terraces and thus look out onto planted areas. The subdivisions between offices are not load bearing and can therefore be spaced as required. Again windows are principally oriented north and south; the east and west walls are mainly blank. At the centre of this floor there is a waiting area with armchairs. This central space from which all the offices can be reached is at the head of both the reader and staff staircases and lifts. The lines of offices have pitched roofs in order to provide an insulating air space to shield the rooms from solar heat gain.

127. Drawing 7 (figure 13) is a north-south section through the main Institute building showing the layering of the various functions. These are marked on the drawing and have been described in more detail in connection with each floor plan. Existing gound level in the area of the main building is about 2.5-3.0 metres below road level. The lowest floor of the building has been placed approximately 2 metres below road level which, it is understood, is sufficiently high above the natural water table to allow for the disposal of surface water.

128. Drawing 8 (figure 14) is a typical cross-section through the south or north walls. It shows the sun-shading and light control devices which are proposed on both these sides. These shielding elements are perforated precast concrete slabs supported on a steel frame. The steel columns rise from concrete walls at lower ground floor level, which occur at the position of the main structural columns and which also act as buttressing walls to the perimeter retaining wall. These fin-like walls are intended to suggest the solid base associated with traditional buildings. The shading slabs will cut out the high summer sun but allow the low winter sun to enter the building as shown on the section. A sun shading diagram for $40^{\circ}$N is given in figure 6.

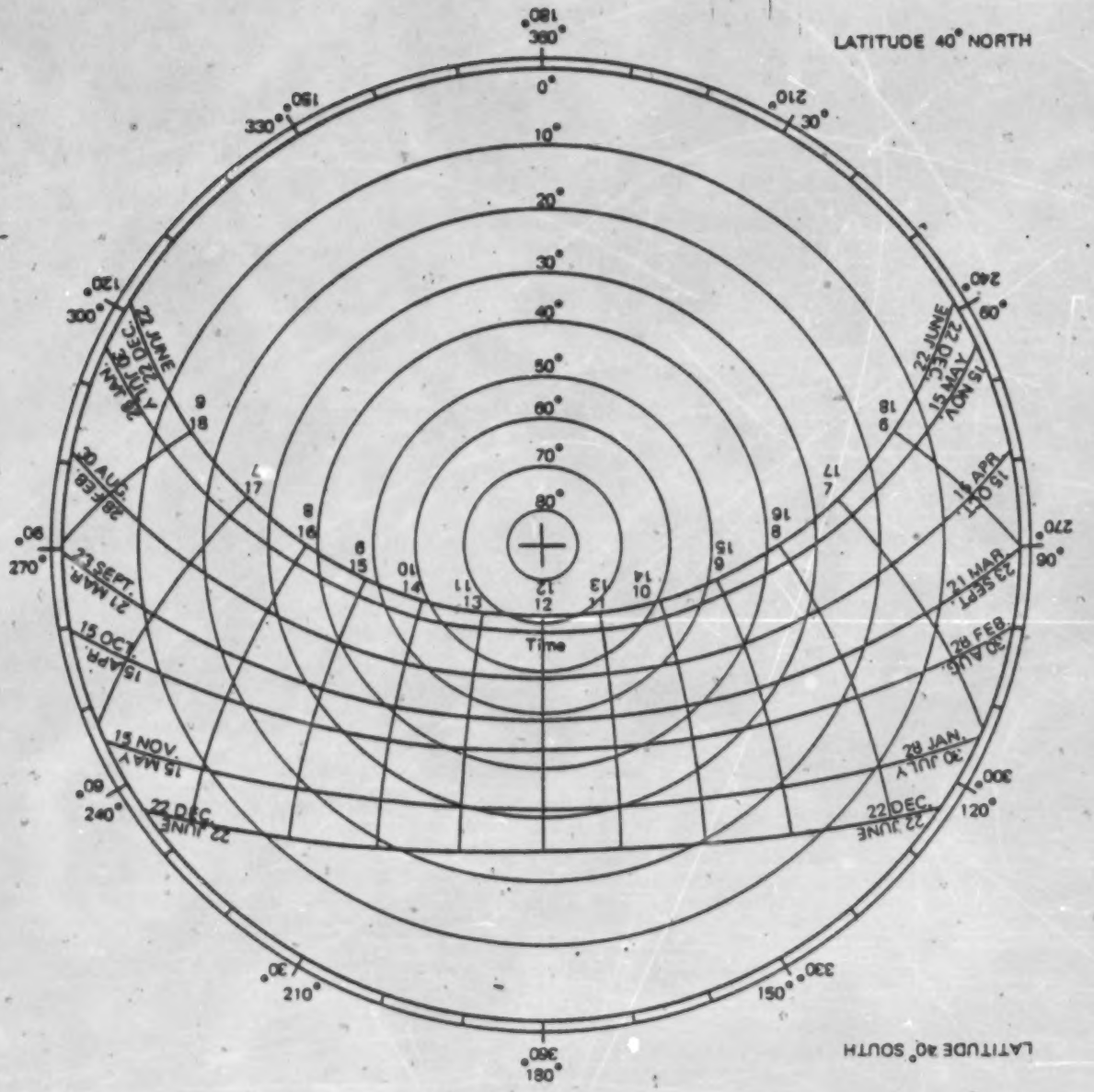



Figure 6. Sun shading diagram

These shading devices have also been designed to minimize sky glare and to reduce the excessive light levels near the window. Such a reduction in light will make for a more even distribution within the internal spaces and thus make the contrast between areas near the window and those further away less obvious.

129. The column spacing which has been adopted throughout the design of the main building is a square grid 7.8 x 7.8 m. This is the same as in the earlier versions. This allows for a flexible layout of both shelving and reader tables. Concrete floors are shown as in situ coffer slabs. Should this column grid prove excessive and uneconomical, a smaller grid of 6.0 x 6.0 m would also be feasible. The organization of the building and the disposition of spaces would not be affected by this variation. The offices on the top floor are constructed directly on the concrete roof slab in blockwork. The outer walls and the walls of the corridor are structural, the cross-walls between offices being non-structural.

130. Drawing 9 (figure 15) is a general bird's eye view of the ISTIC complex of buildings seen from the south-east. The eastern boundary road is the right hand edge of the drawing. The car entrance to the main building, the courtyard to the conference centre and the entrance to the Publishing Division can all be seen to the left of this road. The service and staff entrances and a staff bicycle park are at the top of the sheet. The entrance for readers coming on foot or on bicycle is at the lower left hand side. To the left of that entrance is an outside cafe, to the right the existing ventilator shaft of the underground railway.

131. It is suggested that the dominant colour of the building should be light, perhaps an off-white granite chip rendering as found frequently in Beijing. The framework of the steel colums and beams, shown in detail on Drawing 8 (figure 14), and the balcony rails and supports on the east and west sides, are intended to be painted in the traditional red colour of many Chinese timber colums. The upper parts of the three auditoria are shown as clad in glazed tiles, preferably a deep blue.

132. The main proportions of the design emphasize the horizontal stratification of the building. This would seem to conform to the feeling which is so often found in Chinese buildings of most periods. The horizontal plane is always seen as visually dominant and is made obvious by terraces, stone bases, horizontal divisions of the wall and the separation of the wall enclosure from the roof. The other characteristic which is so frequently seen in Chinese buildings, particularly if they are of any size, is the existence of an external framework which is independent of an inner wall. It was thought appropriate to incorporate both these characteristics in the design and to make them those features which will contribute to the visual impact of the building.

133. Should it be necessary to extend the building in the future, this should occur on the north side. The most likely extension, in the view of the present consultants, would contain offices and these would then link conveniently to the staff circulation. It is, however, much more likely that no extension will be built in the future, but rather that some sections of ISTIC may be moved elsewhere. There are already suggestions that the collection of standards might be moved to another institute. This would free part of the first floor. In view of such possible changes it seems doubly important to plan each floor in such a way that areas are not rigidly demarcated but rather can be arranged flexibly.

134. The design suggestions described in the previous sections (paragraphs 116-133) were discussed at length with ISTIC's office of Building Projects and with the architects of the Institute of Architectural Design who also undertook to re-draw the plans in ink. They were then presented to the Director of ISTIC, a number of Deputy Directors and about twenty leading members of staff. During the subsequent discussion there was general agreement that the horizontal arrangement which formed the basis of this design conformed to the working patterns of the Institute and would allow flexible and efficient use in the future. The plan was welcomed, the only significant concern being whether the Beijing City Planning Office would agree to a design which did not include a substantial vertical element.

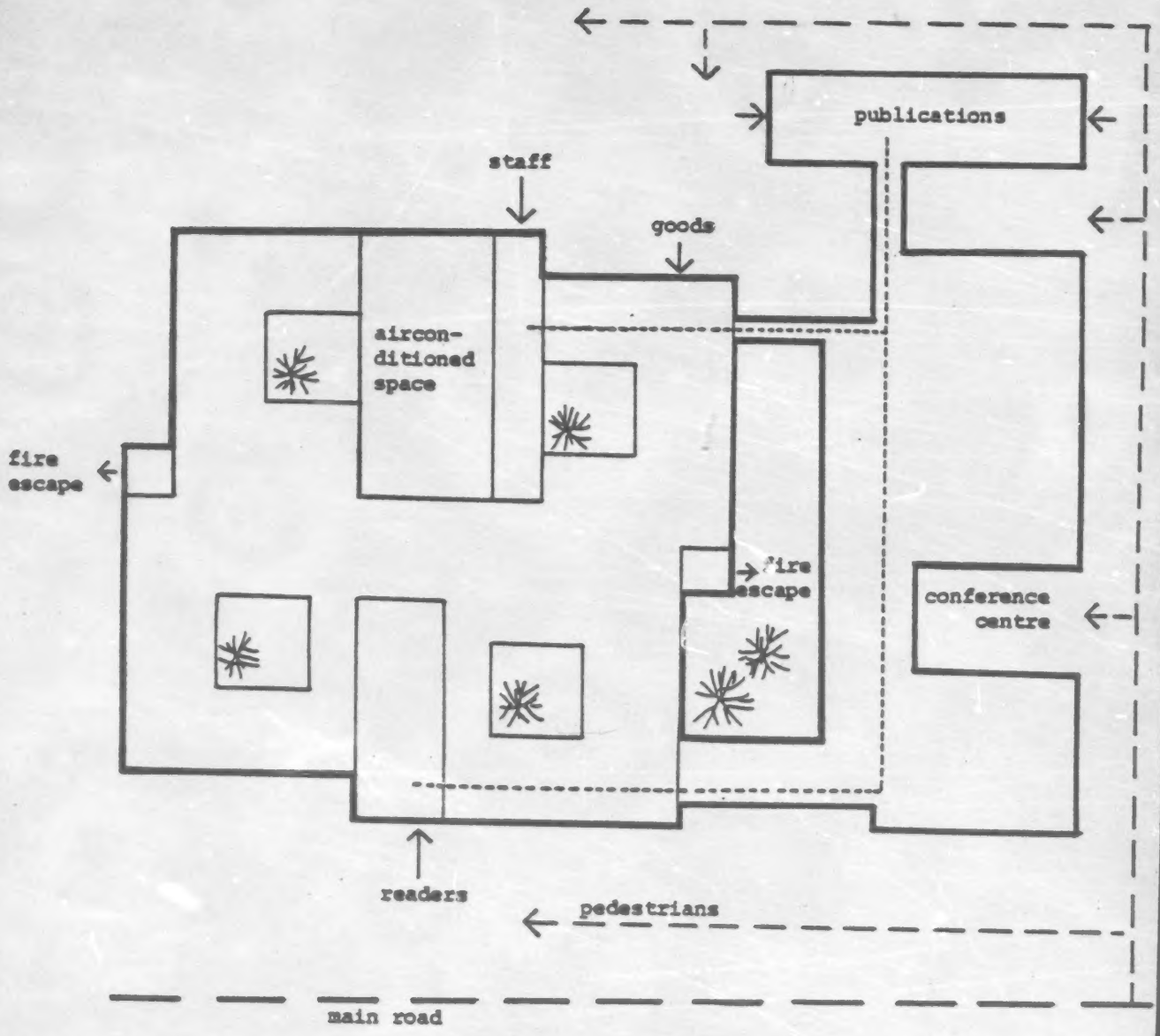



Figure 7. Diagrammatic layout of the buildings

N



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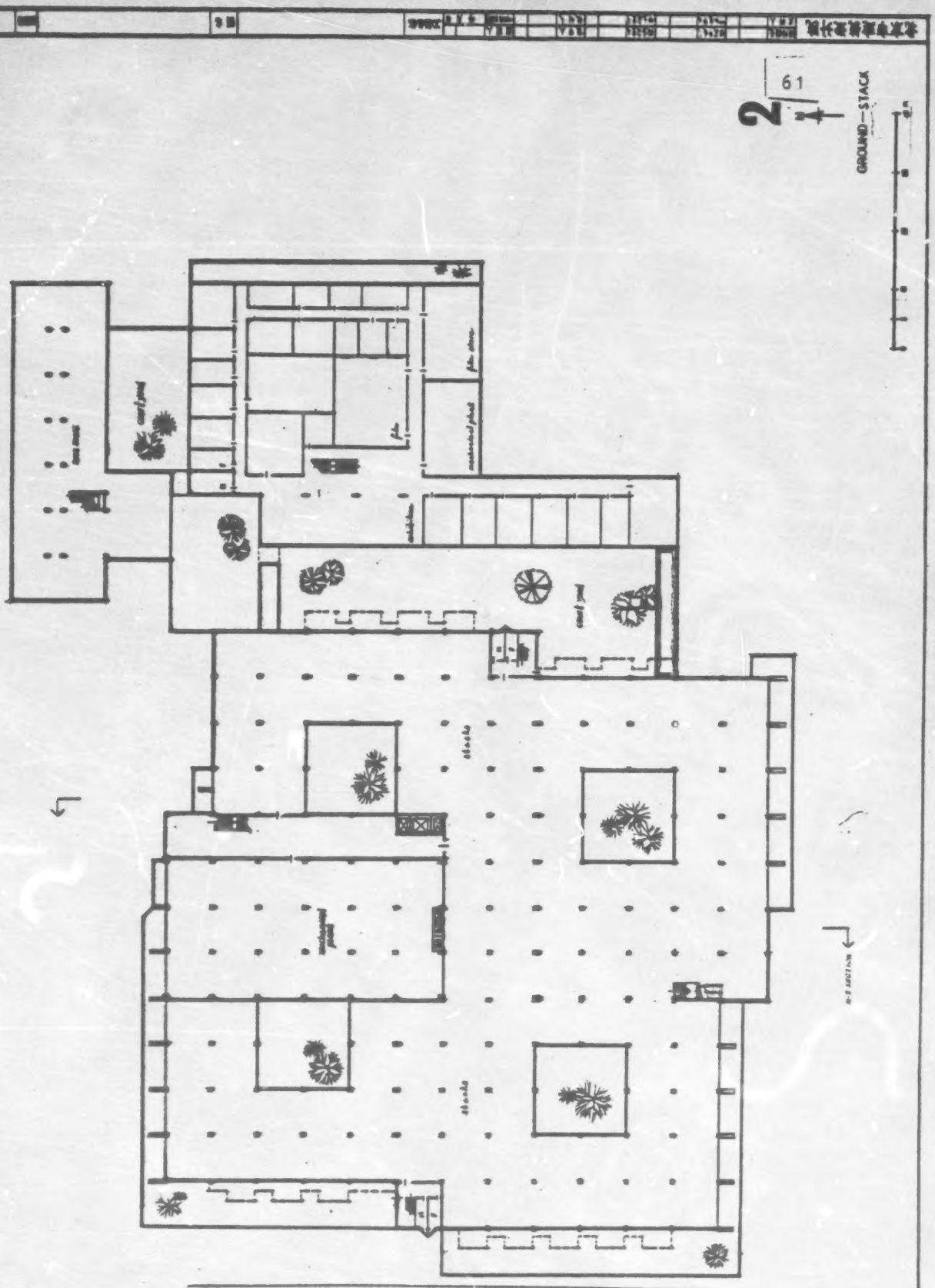


Figure 8. Ground floor plan: stacks
(reduced from original
drawing of scale 1:300)

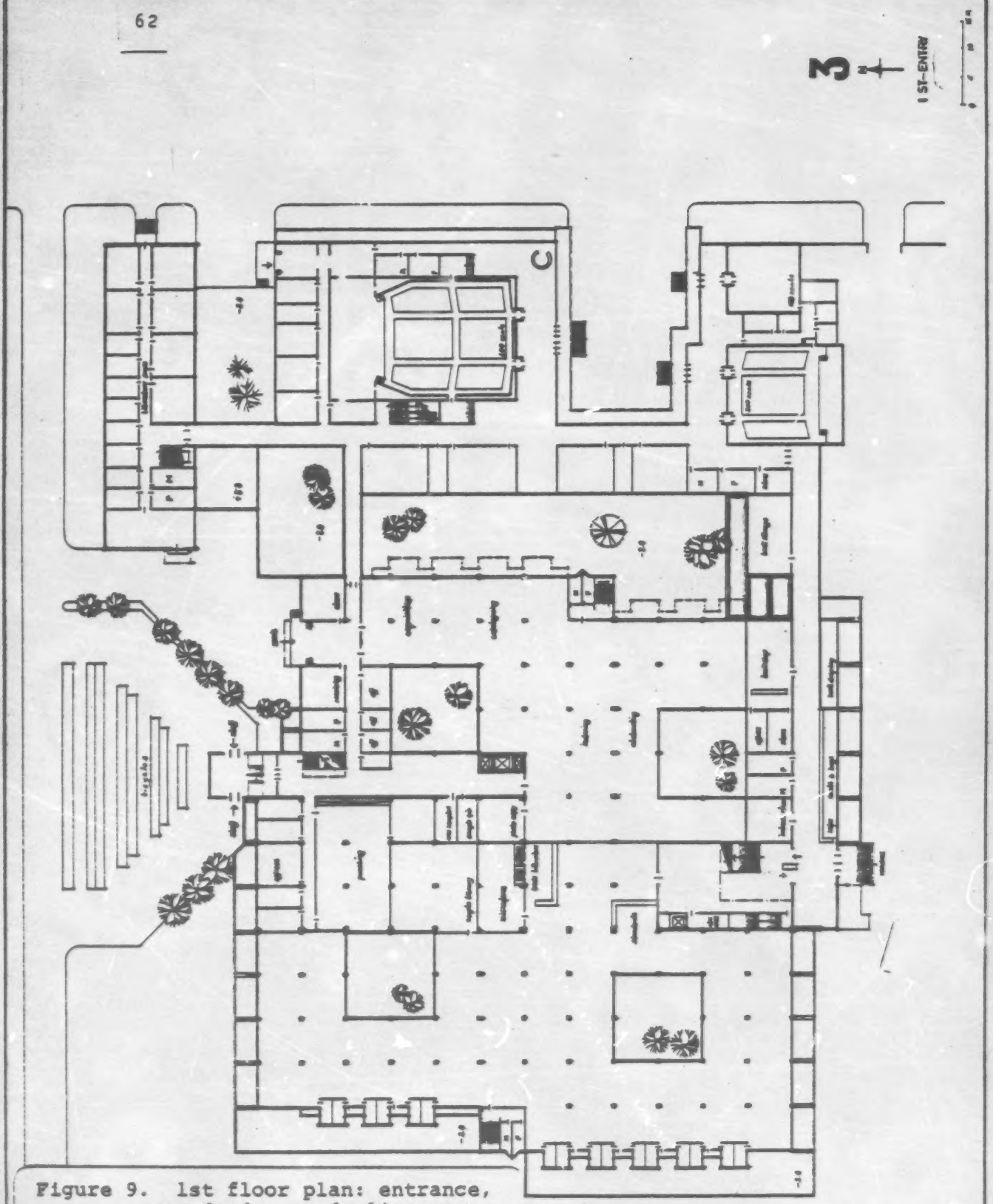


Figure 9. 1st floor plan: entrance, standards, trade literature and acquisition (reduced from original drawing of scale 1:300)

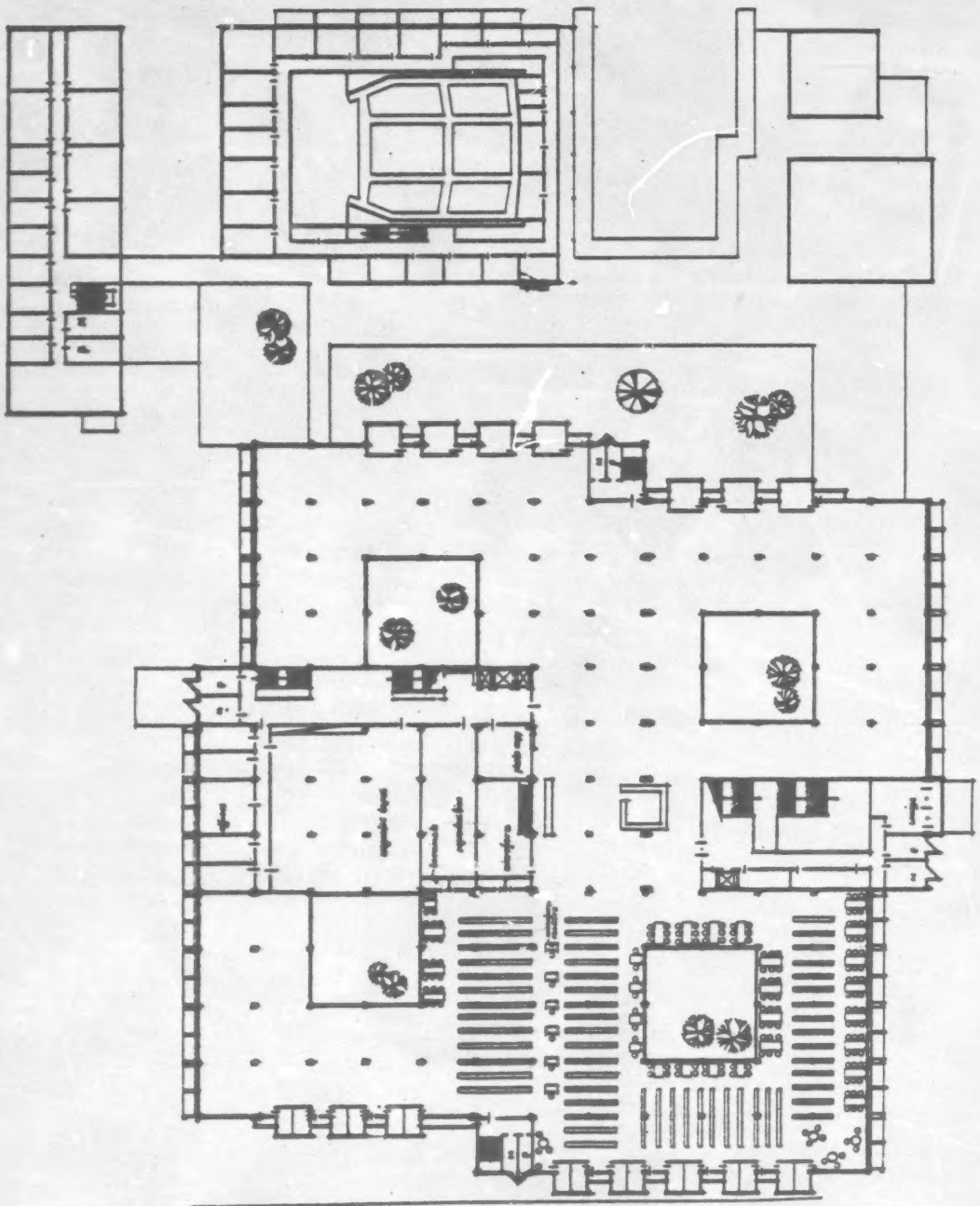


Figure 10. 2nd floor plan: reference and periodicals (reduced from original drawing of scale 1:300)

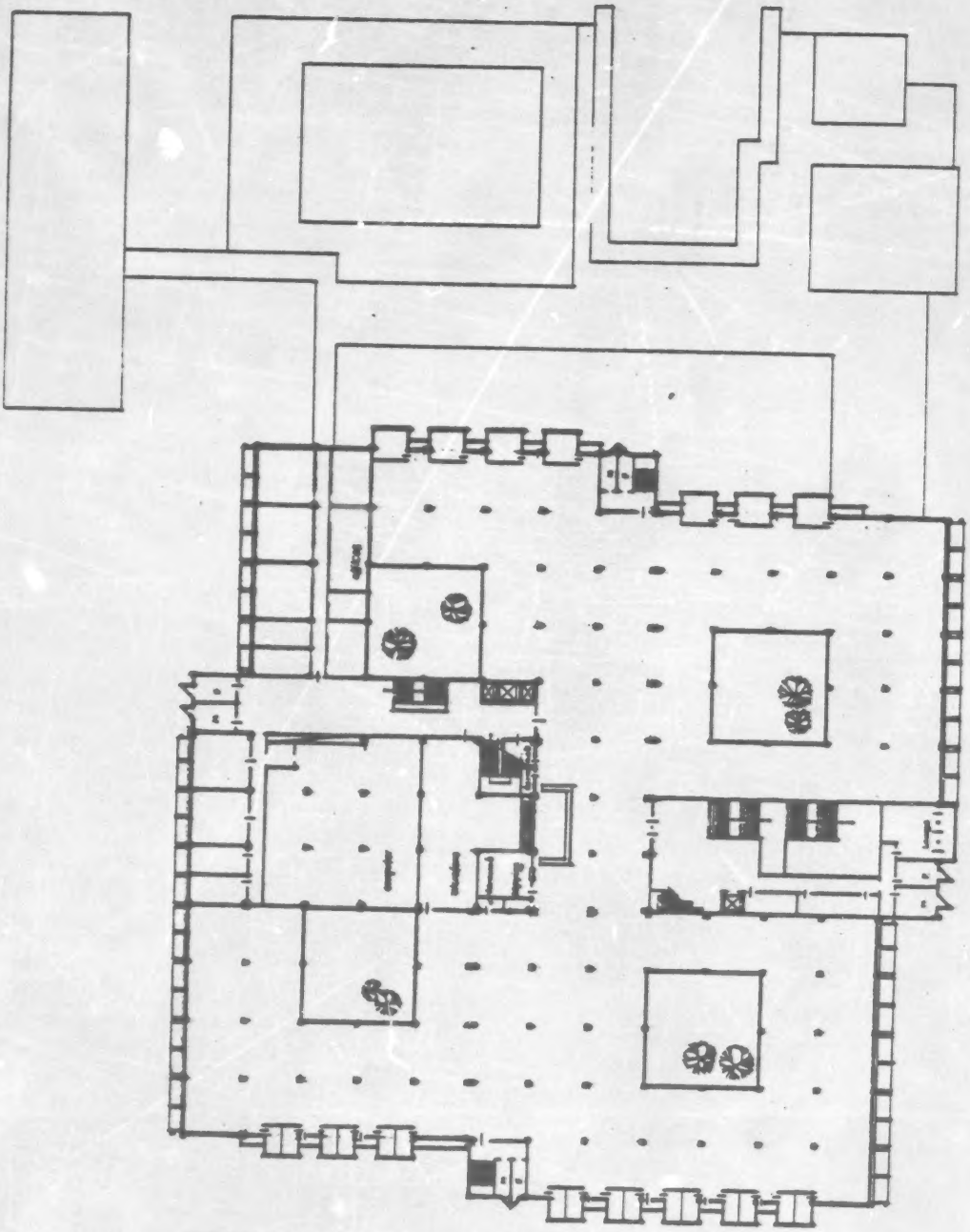

Figure 11. 3rd floor plan: patents (reduced from original drawing of scale 1:300)

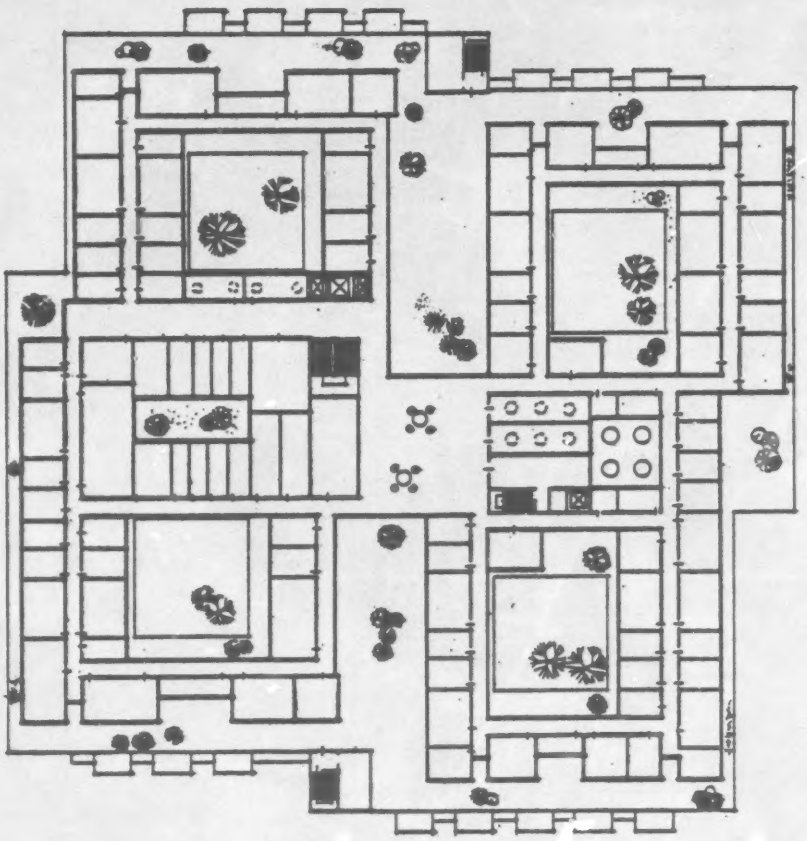

Figure 12.4th floor plan:administration
(reduced from original
drawing of scale 1:300)

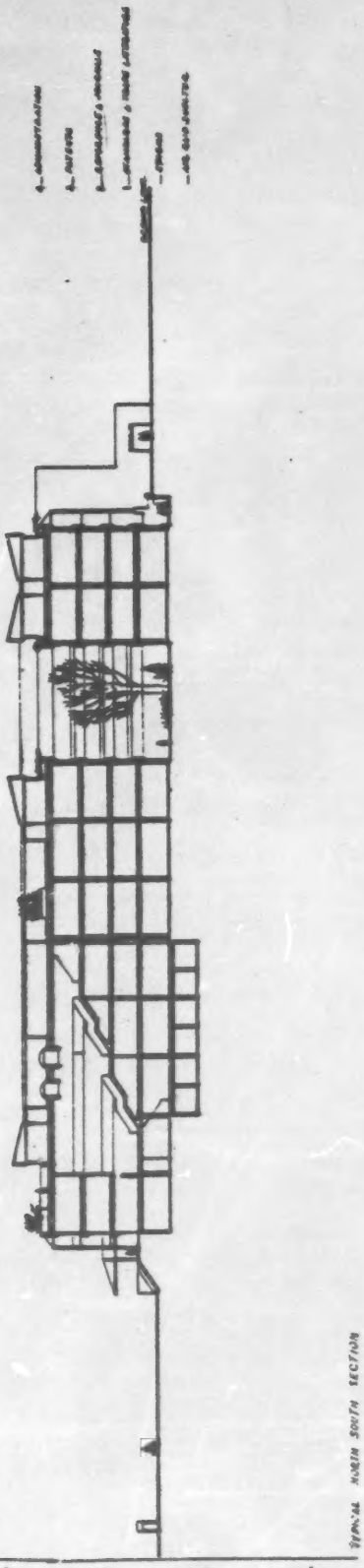

Figure 13. Typical north-south section (reduced from original drawing of scale 1:300)

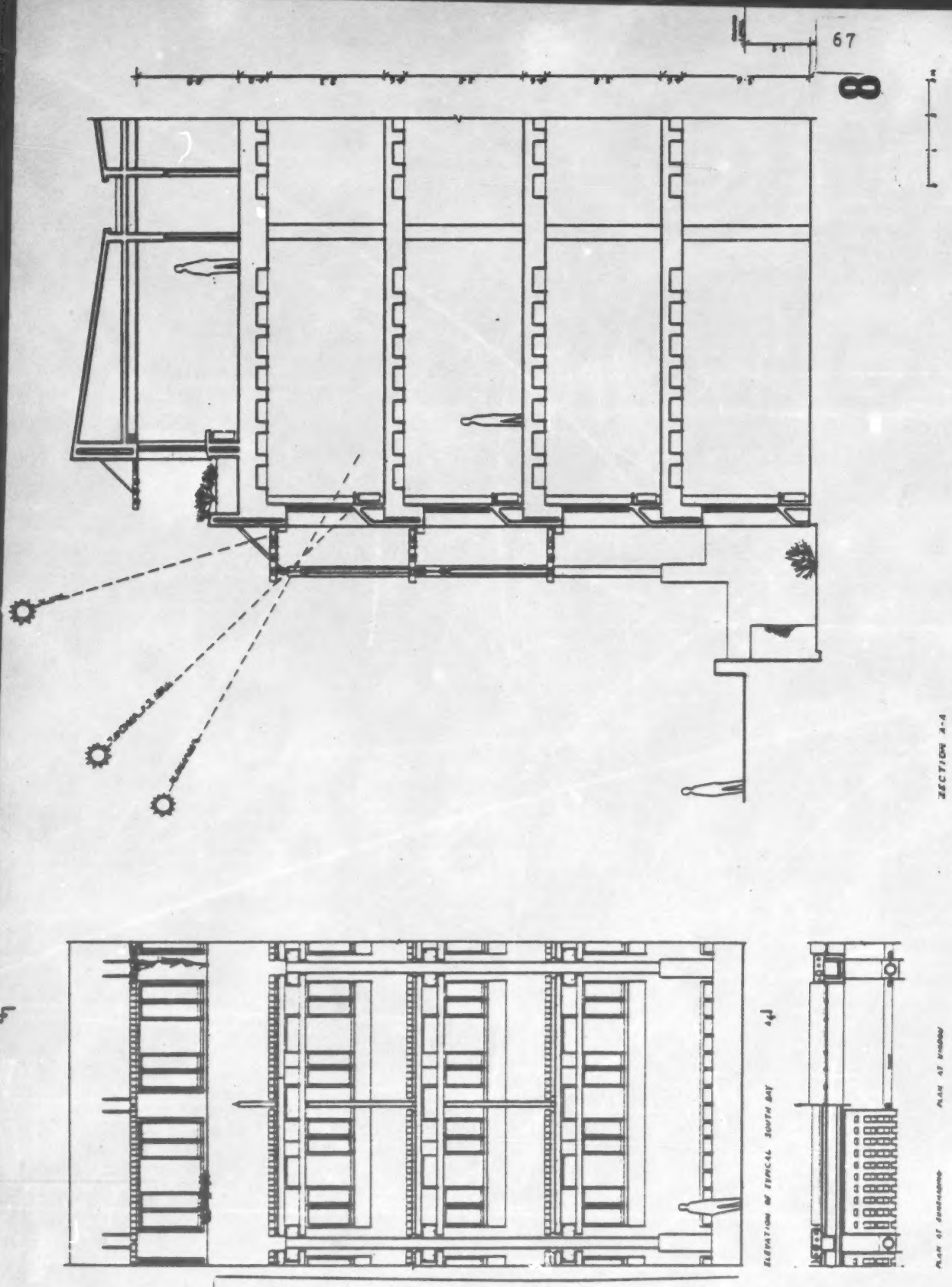




Figure 14. Detailed elevation, section and plan of an external wall (reduced from original drawing of scale 1:50)

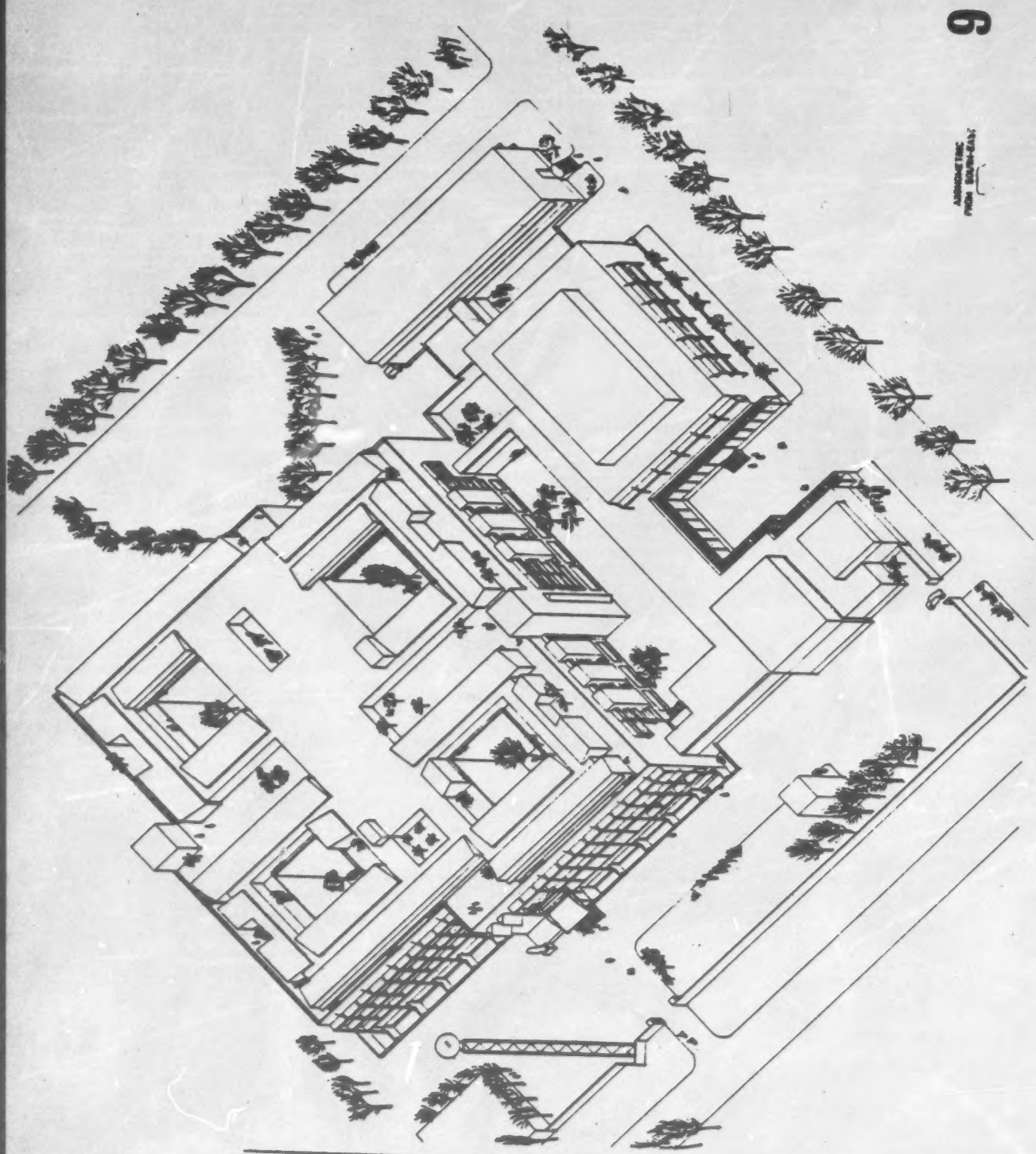

Figure 15.
Axonometric view of buildings
from the south-east
(reduced from original drawing
of scale 1:300)

135. A meeting was held at the City Planning Office attended by the Deputy Director of ISTIC responsible for the new building, other staff members of ISTIC, architects from the Institute of Architectural Design and a considerable number of members of the City Planning Office. The design was described in detail and, in particular, the principles on which it was based. The reason for a low massing of forms was explained both from the point of view of internal arrangement and from the point of view of an appropriate visual relationship with the tall Colour Television Centre. While it was conceded that horizontal planning was of advantage to the workings of ISTIC, there were still some doubts as to whether the building would be "seen". It was pointed out in reply that the building was 160 metres long and nearly 20 metres high and that many of its features would certianly make a strong visual impression.

136. Full size copies of the drawings which are part of this report were left in Beijing. These drawings are on tracing paper so that further copies can be produced easily. The drawings are also sufficiently detailed to allow for them to be elaborated eventually into a comprehensive set of architectural drawings.

137. It is understood that revisions have recently been made in Beijing's planning policy. In the future tall buildings will not be permitted in the immediate centre of the city so as to avoid a conflict between the sky line of such buildings and that of the former Imperial Palace. It should however be recognized that the impact of tall buildings extends over a considerable area as recent construction in Paris, for instance, has demonstrated only too painfully. Beijing may well at some stage desire to extend the area of control beyond the centre. It has also been shown both theoretically and practically that building above about six floors has no significant effect on increasing the density of the city. It would be unfortunate if what may well turn out to be a temporary planning policy should be made to affect the new design for ISTIC and impair its functional efficiency. It is thus strongly recommended that a five storey solution should be adopted.

138. The question of furniture was not discussed in detail during the mission, since it will depend to some extent on a final decision concerning the building design. However, in view of the particular importance of furniture in the use of the ISTIC facilities, a study of this problem should be undertaken at an early stage, and certainly before the constructional drawings are finalized.

REFERENCES


1. Auerbach, I.L.: Computing in China 1979 - An Update (Computer 12:11 (1979) 52-60)

2. Berner, B.: The Organization and Planning of Scientific Research in China today (Discussion Paper Series 134, Research Policy Institute, University of Lund, Sweden, 1979)

3. Broadbent, K.P.: Dissemination of Scientific Information in the People's Republic of China (Report IDRC-148e, International Development Research Centre, Ottawa 1980)

4. Rozensztroch, C.: Cours (UNESCO-BNIST-ISTIC) sur l'automatisation de l'information et l'accès en conversationnel, Pékin 3-28 septembre 1979 (BNIST, Paris 1979)

5. Sigurdson, J.: A Tentative Survey of China's Knowledge Industry and Constraints on its Effective Use (OECD Development Centre, Meeting on the Knowledge Industry and the Process of Development, Paris, June 1980)

6. Sigurdson, J.: Technology and Science in the PRC - An Introduction (Pergamon Press, Oxford 1980); (Swedish edition: Stockholm 1979)

7. Tocatlian, J.: Mission to Asia (Manila, Beijing, Shanghai, Kathmandu and Colombo) 10-28.3.80 (Internal Unesco document DIR/PGI/80/0.38/34, 1 April 1980)

8. Science and Technology for Turning China into a Prosperous and Strong Modern Socialist Country (Report presented to the United Nations Conference on Science and Technology for Development, Vienna 1979)

9. Poncelet, J.: Guide pour l'implantation et l'évaluation des services de diffusion sélective de l'information (PGI/WS/80/14, Unesco, Paris 1980)

10. Dierickx, H. and Hopkins, A.: UNISIST Reference Manual for Machine-Readable Description of Research Projects and Institutions (Report PGI/ORI/80/1.3, Unesco, Paris 1980)

11. Wollman, P.: Guidelines on the Conduct of a National Inventory of Current Research and Development Projects (Report SC/75/WS/13, Unesco, Paris 1975)

12. Proceedings of the UNISIST International Symposium on Information Systems and Services in On-going Research in Science (organized in Paris 27-29 October 1975 by Unesco in collaboration with the Smithsonian Science Information Exchange, Washington DC; published by the Hungarian Central Technical Library and Documentation Centre, Budapest 1976)

13. Information Services on Research in Progress. A Worldwide Inventory (edited by the Smithsonian Science Information Exchange, Washington, D.C. and Unesco; published by the Hungarian Central Technical Library and Documentation Centre, Budapest 1978)

14. Library and Information Science in China (Bull. Am. Soc. for Information Science 6:4(April 1980)5-18)

15. Loh, S.C. and Kong, L.: Computer Translation of Chinese Scientific Journals (in "Overcoming the Language Barrier", Proc. 3rd Europ. Congress on Inf. Systems Networks, Luxembourg 3-7 May 1977, Verlag Dokumentation, München 1977)

16. Uchida, H.: Information System, Data Bases, and On-line Services of the Japan Information Centre of Science and Technology (JICST) (J. Chem. Inf. Comput. Sci. 19:4(1979)199)

17. Maier, J.M.: Information Technology in China (Asian Survey 20(1980)860-875)

18. Murata, S.: The Information Processing of Chinese Characters and Problems about it in the People's Republic of China (Joho Kanri - Journal of Information Processing and Management 23(1980)614-623) /in Japanese/

Publications produced by ISTIC:

I-1 The Institute of Scientific and Technical Information of China (Brief presentation of ISTIC, (copy of manuscript) ISTIC, Beijing 1980) 7 p.

I-2 A Brief Introduction to Various Vocational Departments of ISTIC (ISTIC 1980)

I-3 ISTIC Project for Automatic Computer Information System (Analysis) of procedures (Copy of manuscript, ISTIC, Beijing, August 1980) 11 p. + flow diagrams

I-4 Brief Description of the Application of Mini-Computers in the Computer Group of ISTIC (Copy of manuscript, ISTIC, Beijing 1980) 5 p.

I-5 Summary of Building Design Requirements of ISTIC (Copy of manuscript, ISTIC, Beijing 1980)

I-6 Building Design Requirements of the China Information Centre of Science and Technology (Copy of manuscript, ISTIC, Beijing 1980)

I-7 Catalogue of Current Foreign Periodicals at ISTIC 1977 (ISTIC, Beijing 1978); (7,100 titles)

I-8 Brief Introduction to Scientific and Technological Reference Literature (with notations on availability at ISTIC); (ISTIC, Beijing 1973, supplement 1980)

I-9 Bibliography of Foreign Scientific and Technological Literatures (four indexing journals edited by ISTIC in co-operation with various semi-governmental organizations, and published by ISTIC)

I-10 Catalogue of Foreign Literature (11 indexing journals-partly with translated abstracts - edited and published by ISTIC)

I-11 Catalogue of Patents (6 indexing journals edited and published by ISTIC)

I-12 Information publications concerned with standards (edited and published by ISTIC):

(a) Catalogue of National Standards of the People's Republic of China; (b) Bibliography of Standards; (c) Foreign Standards Announcements; (d) Trends in Foreign Standardization

I-13 Popularizations (edited and published by ISTIC):

(a) Trends in Foreign Science and Technology; (b) Review of World Inventions; (c) Scientific and Technological Information Work

## APPENDIX 1: LIST OF PARTICIPANTS IN MEETINGS DURING THE MISSION

State Scientific and Technological Commission

| | |
|---|---|
| H.Exc. Jiang Ming | Vice Minister, Vice-Chairman of the State Commission |

Chinese National Commission for Unesco

| | |
|---|---|
| Cao Zi-feng | Chief of the Secretariat of the Commission |
| Zhang Xue-zhong | Secretariat of the Commission |

Institute of Scientific and Technical Information of China (ISTIC)

| | |
|---|---|
| Lin Zi-xin | Director of ISTIC |
| Zhang Zheng-bing | Deputy Director of ISTIC |
| Wang Wei | " |
| Li Xin | " |
| Yang Hong-ren | Deputy Director of 1st Division of Planning and Operations |
| Liu Hun-chio | Deputy Director of 1st Division of Administration |
| Yang Hua | Deputy Director of 2nd Division of Planning and Operations |
| Wang Jing-yeun | Director of Division of International Relations and Cooperation |
| Zhang Feng-lou | Deputy Director of Division of Computer Services |
| Lan Bai-li | Deputy Director of Division of Projects and Building |
| Yao Wei-'an | Director of Division of Information Methodology |
| Liu Zhao-dong | Deputy Director of Division of International Relations and Cooperation |
| Wang Yung-tai | Division of Logistics |
| Bai Guang-wu | Reference Service |
| Han Zi-ying | Library of Patents |
| Zhao Yang-ling | Division of International Relations and Cooperation |
| Zhou Shu-sen | Division of International Relations and Cooperation |
| Zhao Zong-ren | Division of Information Methodology |
| Wu Rong-ren | " |
| Wu Yong-young | " |
| Zhang Zong-xin | Division of Computer Services |
| Liao Yan-ling | " |
| Kuo Hou-guan | " |
| Li Xiu-jin | " |
| Chang Cheng-ching | " |
| Feng Lin-yi | Cataloguing Group |

Beijing Library

| | |
|---|---|
| Li Jia-yung | Deputy Director |
| Zhou Zeng | Director of Office of Capital and Construction |
| Li Xiun-da | Director of Foreign Affairs |
| Yang Yun | Chinese Academy of Building Design |
| - | Electronic Computers Section |

Chinese Academy of Sciences Library

| | |
|---|---|
| - | Deputy Director |

Beijing University Library

| | |
|---|---|
| Guo Song-nian | Deputy Director |
| - | Beijing University Computer Centre |

China National Publications Import Corporation

| | |
|---|---|
| Xiu Mai-sheng | Deputy Director |
| Bai Yu-lin | Director of Book Exhibitions |
| Hong Dao | Director of Catalogue Department |
| Zao Bi-yuan | Editor of World Books |

Beijing City Planning Bureau

| | |
|---|---|
| Li Zhun | Deputy Director and Chief Architect |
| Tian Ru-geng | Architect |
| Jiang Hui-lian | Architect |
| Rui Jing-wei | Architect |

Beijing Institute for Architectural Design

| | |
|---|---|
| Bai De-mao | Deputy Director |
| Zhang Kai-ji | Chief Architect |
| Wang Hai-hua | Architect (project architect for ISTIC building) |
| Li Yi-xia | Architect |
| Wei Chun-yi | Electrical Engineer |
| Ke Cheng-hua | Structural Engineer |

Technical Information Institute, Academy for Building Construction

| | |
|---|---|
| Shi Yaz-hang | Director |

Information Processing and Training Centre for International Economic Development (& Beijing Computer Centre)

| | |
|---|---|
| Zhang Qi-kun | Director, IPTCIEC |
| Wu Wen-da | Deputy Director, IPTCIEC |
| Mo Geng-shen | Deputy Director, IPTCIEC |
| Huag Qin-hua | Hardware Engineer |

UNDP

| | |
|---|---|
| Kerstin Leitner | Assistant Resident Representative |

British Embassy

| | |
|---|---|
| Vivian Hart | Second Secretary (Cultural) |

Swedish Embassy

| | |
|---|---|
| Nils Ekblad | Science and Technology Attaché |

## APPENDIX 2: SOME FINDINGS FROM VISITS TO INSTITUTIONS IN JAPAN, UNDERTAKEN IN OCTOBER 1980 BY STEPHAN SCHWARZ

1. In order to provide the consultants with additional background material for the present report a number of study visits in Japan were arranged by Unesco with special emphasis on a survey of the state-of-the-art of Kanji processing. The following institutions were visited:

a. Section of Electronics Standards
Standards Division
AIST/MITI
No 33 Mori Building
3-8-21 Toranoman
Tokyo

b. National Institute of Japanese Literature
1-16-10 Utaka-cho
Shinagawa-ku
Tokyo 142

c. National Language Research Institute
3-9-4 Nishigaoka
Kita-ku
Tokyo

d. National Diet Library
Computer Processing Division
1-10-1, Nagata-cho
Chiyoda-ku
Tokyo 100

e. Tokyo University
University Library and University Computer Centre
7-3-1 Hongo
Bunkyo-ku
Tokyo 113

f. Japan Information Centre of Science and Technology (JICST)
2-5-2 Nagata-cho
Chiyoda-ku
Tokyo 100

g. Tsukuba University
Science Information Processing Centre
1-1-1 Tennadai
Sakura-mura
Ibaraki-ken 305
Japan

Gratitude is due to all those who have spent considerable time explaining and demonstrating the activities and results of their institutions.

2. In recent years, contacts have been established between many Japanese and Chinese institutions. Training of ISTIC staff at JICST is planned to start in November 1980. Training for staff from Beijing Library at the National Diet Library is foreseen shortly. Since 1979 there has been co-operation between the Industrial Standards Committees in China and Japan to create matching standards for Chinese Language Computer Processing Systems. A Japanese "Standard Code of the Japanese Graphical Character Set for Information Exchange" (JIS-C-6226) was established in 1978, containing 2,965 first-level and 3,384 second-level characters. There is therefore considerable interest in Japan in joint efforts concerning character processing problems in all countries where Chinese characters are used (reference J13). At the same time there was in some Japanese institutions surprisingly little interest in mutual contacts, e.g., in the recent international conference in Hong Kong (reference J3) which dealt with Chinese character processing.

3. In the last few years there has been a breakthrough concerning equipment for Kanji-processing technology, i.e. terminals for input and interaction, processors and printers. Since a 2-byte code is used internally in this equipment, more than 30,000 characters can be addressed. Simple procedures are available for introducing new character fonts to the basic sets supplied by the computer manufacturer, which makes it possible for any institution to create an adequate set of characters for its particular purpose. About 3,000 characters are accessed directly from a keyboard, while the rest are accessed through 4-digit codes or other appropriate techniques involving interactive selection of less frequent characters. The availability of recent equipment and of computer power in Japanese research institutions is remarkable. It is important to note that leading computer manufacturers, like Hitachi and Fujitsu, now produce hardware which is to a great extent compatible with IBM equipment. This has immediate implications on ISTIC's choice of computer equipment, since it makes it possible to take advantage of developments in Japan in Kanji processing and in on-line retrieval systems, without foreclosing implemention of one of the established "western" systems for bibliographic retrieval services, most of which operate on IBM-compatible equipment.

4. The practical problems of Kanji processing (i.e., input, editing, file handling, retrieval, display and printing) have been solved to a large degree (see references J6, J7, J8, J13, J16, J19, J20, and J21). This means that Japanese bibliographic data bases can be created and operated in the same way as ordinary alpha-numeric databases. In the JICST systems, the processes of generation of bibliographic files, files of research staff and of ongoing R&D projects, thesaurus maintenance, on-line availability of data bases, and production of printed abstract journals have been integrated in an efficient and interesting way.

5. Several on-line retrieval systems and services for bibliographic and non-bibliographic data bases have been created, notably

   a. JOIS K and its successor JOIS II (Japan Information Centre of Science and Technology, references J1 and J2);

   b. IDEAS/77 (University of Tsukuba, Science Information Processing Centre, references J9-J10);

   c. TOOL-IR (University of Tokyo, University Computer Centre, reference J18).

6. The JOIS system now offers the JICST Japanese language bibliographic files, and the IDEAS/77-system, at least in an experimental stage, offers the Japanese Marc files produced by National Diet Library (reference J14). Computer networking is being discussed in terms of an Inter-University Science Information Network, using the Japanese Digital Data Exchange (DDX) Network (references J4, J5, and J11). Present on-line systems are accessible via leased telephone lines and dial-up nodes.

日中友好のかけ橋　日中平和友好条約締結の背景とこれからの日本外交　井上一成著
摂津　井上一成事務所　1978.9
54p　19cm
日中交渉の歩み・社会党中国関係年表：p50～54

1.Nitchū yūkō no kakehashi　a1.Inoue,Issei
s1.日本－外国関係－中国（1949～　中華人民共和国）
s2.中国（1949～　中華人民共和国）－外国関係－日本
①A99-ZC9　⑤319.1022

A99-ZC9-46　JP80-30346
55.09.16　1　150805　325

シャカイフクシ　（社会福祉）

社会福祉と政治経済学　一番ケ瀬康子編著
東京　一粒社　1979.12
444p　19cm　（社会福祉と隣科学　2）
執筆：石毛鍈子ほか

見本

1.シャカイ　フクシ　ト　セイジ　ケイザイガク　2.シャカイフクシ　ト　シャカガク　a1.イチバンガセ，ヤスコ　s1.社会福祉　s2.経済学　①EC23　⑤369

2900円
EC23-118　JP80-09755
55.04.11　3　020020　3670

Figure 16　Catalogue cards from the National Diet Library

# 002 A79161263. K79080216
合成洗剤の分解に関する研究 I 河川水による分解の効果
中原俊治，奥田正，名切徹，森永繁則，くぼ田芳文（長崎市試）
F424A 水処理技術 VOL.20 NO.3 PAGE. 227－231 '79
(J) (a1) (JA ) (JPN) 写図 7表 2参 10
河川中におけるＡＢＳとＬＡＳの生分解特性について実験．長崎市内中島川を採り，一定条件下でＡＢＳとＬＡＳを添加し，生分解性を測定したところ，生分解性のパターンは両者で特徴的な相異が見られた．河川水を３～１０倍に希釈しても生分解率はほとんど一定であり，洗剤を含む下水が大量の雨水の混じる河川へ放流されても生分解を受けるものと予想された．またＡＢＳとＬＡＳの生分解率は溶存酸素の影響をあまり受けないこと，生分解の至適温度は３７℃であることがわかった
KB020603 (614.777:577.476)
洗剤；河川汚濁；河川水；自浄作用；ＡＢＳ；ＬＡＳ；分解；水質

Figure 17 Printing from a terminal with 16x18 mechanical matrix printer (2900 characters are stored in read-only memory (ROM), terminal is about normal typewriter size).

〔概要〕

ＳＤＣ－ＫＩＳ（ＳＤＣ漢字情報処理・図形処理システム）は、高価な本格的漢字情報処理・図形処理システムです。ＳＤＣ－８Ｍコンポーネントコンピュータをコントローラに、出力装置としてレーザビームプリンタ（ＬＢＰ－１０）を使用しています。

入力装置は漢字タブレット、ＣＲＴ、上位計算機からの通信結合等のオプションで構成することができ、フレキシビリティに富んでいます。

漢字・図形等の出力が自由に拡大できる画期的なシステムです。

日本語、英語、ロシア語、アラビア語、中国語などのワードプロセッサ、オフィス・オートメーションの世界で大活躍が期待いただけます。

上位機種には、ＳＤＣ－ＫＩＳ（１６）があり、コントローラとしてＳＤＣ－１８Ｍ、ＳＤＣ－１６を、出力装置としてレーザビームプリンタＬＢＰ－２０００，ＬＢＰ－３５００を使用し、高速化がはかれます。

〔構成図〕

Figure 18 Printout from laser-beam printer (Canon LBP 20)

539.3 M78010930
底面が平らな円形スタンプが弾性半空間上の層に与える作用〔a①〕 RU 〔土〕
Действие жесткого в плане штампа с [illegible] основанием на слой, лежащий на упругом полупространстве. ГУБЕНКО В С, КИСЕЛЕВ М Я, ЛАМЗИН Д А: R363A Prikl Mekh (SUN) 11(7) 11-16('75)
弾性半空間上の厚さの弾性層へ外径b,内径aの円形スタンプを等方両力で押しこみスタンプ下の接触応力を決定する。接触領域は円環で区分される3領域に対応する3つの混合方程式を導くことになる。積分方程式系は先に明らかになった上面に接触応力のない多層基板に対するコンプライアレス関数の性質を使って第2種フレドホルム形方程式に導き数値解を得た。空間の弾性定数が層の値より著しく小のときスタンプの底の下で応力符号が変化し,a'bの一定値以上では層とスタンプのはがれが生じる。h/b≧1.5では層を半空間として計算できる。接触応力とスタンプ押込み量の簡単な式を得た；写図3表1参6

539.3 539.3/.5 M78010933
急冷したイオン結晶における応力 I 理論〔a①〕 EN 〔土,物〕
Stresses in quenched ionic crystals. I. Theory. KEELEY B A, BURGE R E, SPRACKLING M T: B992B J phys D (GBR) 8(11) 1255-1263('75)
平面ひずみの条件の下で急冷された結晶における熱応力の発達を時間の関数として記述する式を立てた。一次元および二次元における熱波の効果および有限熱伝導係数の効果を考慮して解析を行なった。代表例としてNaClについて数値計算を行なった。熱伝導係数hの与えられた値に対し,試料の塑性変形の性質と大きさは急冷パラメータSQPの増しまに依存する。大きなSQPの値に対しては表面領域は引張方向に塑性変形し,この塑性域が結晶内部に広がる。SQPが小さいときは中心領域が圧力方向に塑性変形し,外側の領域は再び弾性となる；写図6参8

Figure 19 Entries in a JICST abstract journal

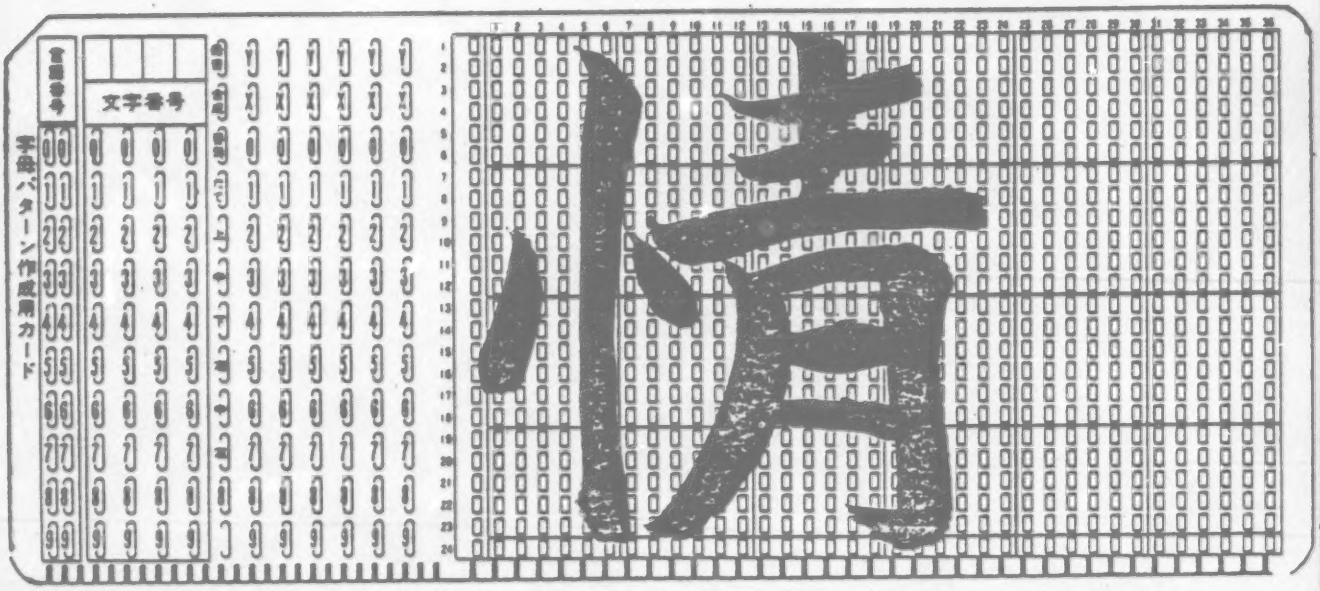


Figure 20 Entry card for optical reader entry in the Kanji character font generation procedure (University of Tsukuba, Science Information Centre).

REFERENCES FOR APPENDIX 2:

J-1 The Japan Information Centre of Science and Technology - 1979 (Information folder, JICST, Tokyo 1979)

J-2 Uchida, H.: Information System, Data Bases, and On-line Services of the Japan Information Centre of Science and Technology (JICST) (J. Chem. Inf. Comput. Sci. 19:4(1979)199)

J-3 Chinese Data Processing and Text Handling: The Next Frontier (International Conference organized by the Hong-Kong based "Chinese Language Computer Society", Hong Kong, October 1980)

J-4 Toyama, A., Nakayama, K. and Oikawa, A.: Promotion of Information Science Research in Japan (Inf. Proc. & Management 16(1980)199-222)

J-5 A New Plan for a "Science Information System" (A Report of the Science Council, Ministry of Education, Science and Culture, Tokyo, January 1980)

J-6 Nakano, H., Tsuchiya, S. and Tsuruoka, A.: Automatic Processing of the Natural Language in the Word Count System (National Language Research Institute, Tokyo. Presented at Computer Linguistics Conference, Tokyo, September 1980)

J-7 Tanaka, T.: Statistical Analysis of Japanese Characters (National Language Research Institute, Tokyo. Presented at Computer Linguistics Conference, Tokyo, September 1980)

J-8 Nakayama, K. and Oikama, A.: Current State of Affairs of Japanese Language Information Processing and its Practice at the University of Tsukuba (Science Information Processing Centre, University of Tsukuba, Japan, October 1980)

J-9 Nakayama, K. et al.: On-line Information Retrieval at University of Tsukuba (Science Information Processing Centre, University of Tsukuba, 1980)

J-10 Begum, H., Higashibara, Y. and Kumano, Y.: IDEAS/77 - Elementary Course for Beginners (Science Information Processing Centre, University of Tsukuba 1980)

J-11 Nakayama, K., Tezuka, A. and Toyama, A.: Resources Sharing Network in Japanese University (Bureau of Science and International Affairs, Ministry of Education, Science and Culture 1979)

J-12 Mechanization Projects at the National Institute of Japanese Literature, Tokyo 1972-1977 (Programme 12:3(1978)125-138)

J-13 Takahashi, T.: A Proposal for a Standardized Common Use Character Set in East Asian Countries (Contribution to IFLA Council 1980)

J-14 Tamura, K.: JAPAN/MARC - Its Present Status and Future Prospects (Contribution to IFLA Council 1980)

J-15 Library Automation in the National Diet Library (Specification of equipment and rental costs), (Manuscript, Tokyo, March 1980)

J-16 Yagi, Y. and Yamada, Y.: Japanese Word Processor RICOH TX620 (Ricoh Technical Report No 2, November 1979)

J-17 Inose, H. (ed.): Research on Scientific Information Systems in Japan (Computer Centre, University of Tokyo 1980) 257 p.

J-18 Yamamoto, T. et al.: Four Years of TOOL-IR: The Reception of an On-Line Information Service by Japanese Users (pp. 127-132 in reference J17)

J-19 Nagao, M., Tsujii, J. and Matsuyama, T.: Methodologies of Japanese Language Treatment by Computer for Information and Documentation Sciences (pp. 229-235 in reference J17)

J-20 Nisimura, H.: Standardization effort of Japanese Character Set (Presented at the International Symposium on Arabic Language Character Sets, Codes and Keyboards, Riyadh, Saudi Arabia, 1-4 June 1980)

J-21 International Organization for Standardization (ISO-TC 97N): Japanese National Activity Report (October 1979)